

NASA TECHNICAL  
MEMORANDUM

NASA TM X-53472

June 6, 1966

NASA TM X-53472

SATURN AS-201/APOLLO POSTFLIGHT TRAJECTORY

By Jonathan B. Haussler and William G. Smith  
Aero-Astrodynamic Laboratory

FACILITY FORM 602

(ACCESSION NUMBER)	(THRU)
TMX-53472	2 B
(NASA CR OR TMX OR AD NUMBER)	(CODE)
	30
(CATEGORY)	

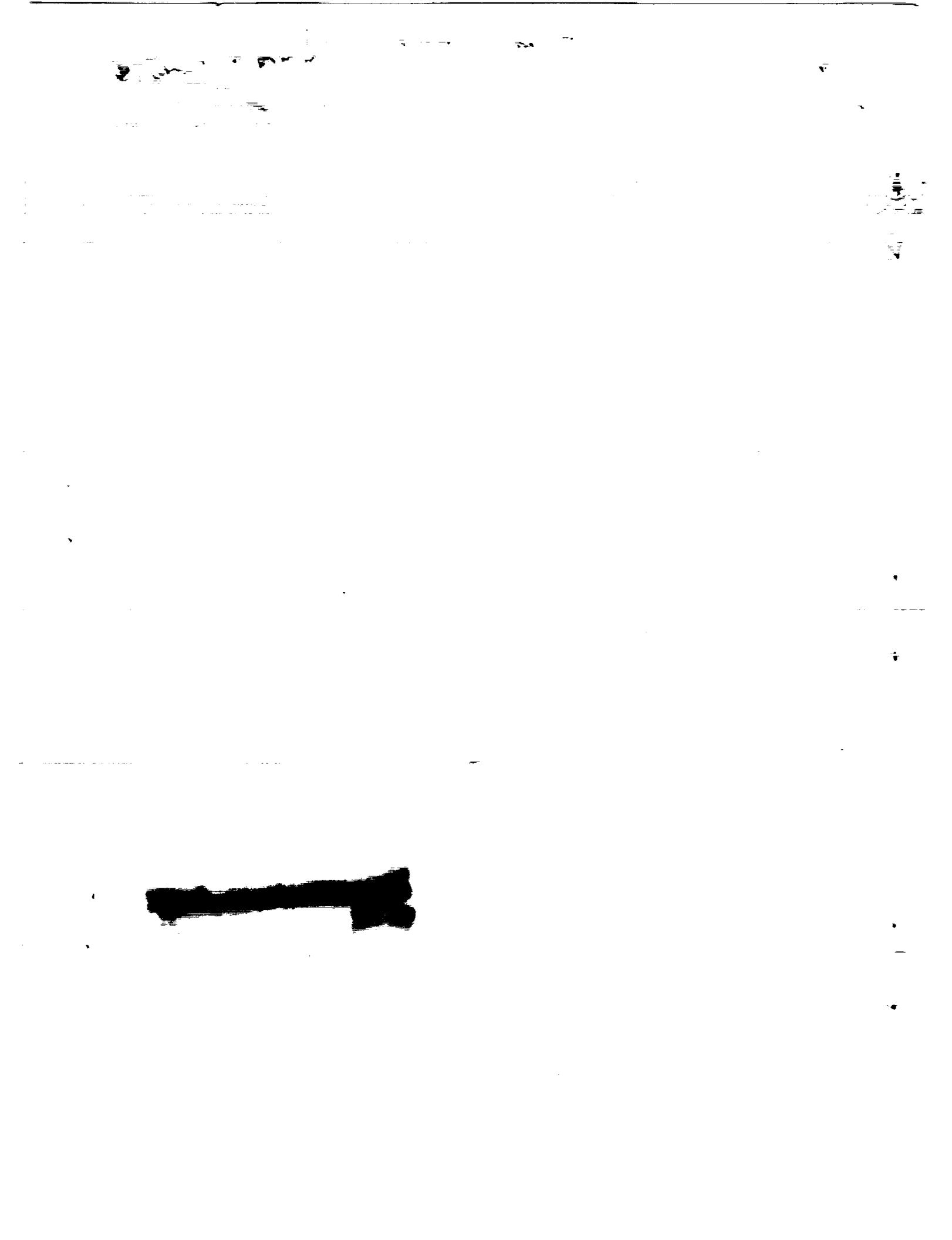
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George C. Marshall  
Space Flight Center,  
Huntsville, Alabama

(NASA-TM-X-53472) SATURN AS-201/APOLLO  
POSTFLIGHT TRAJECTORY (NASA) 103 P

N92-70421

Unclassified  
29/12 0083633



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ABSTRACT

This report presents the postflight trajectory for the Saturn AS-201/Apollo test flight. First of the Saturn IB series, AS-201 was the first vehicle to carry an Apollo spacecraft. Trajectory-dependent parameters are given in earth-fixed, space-fixed ephemeris and geographic coordinate systems. A complete time history of the powered flight trajectory is presented at 1.0 sec intervals from first motion to S-IB/S-IVB separation, 5.0 sec intervals from S-IB/S-IVB separation to S-IVB cutoff and 10.0 sec intervals from S-IVB cutoff to S-IVB/CSM separation.

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RESEARCH AND DEVELOPMENT OPERATIONS



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SUMMARY

The powered flight trajectory presented here was established from the data provided by external electrical and optical tracking systems and the onboard data provided by the ST-124M guidance platform. External tracking data were available from fixed camera, ODOP, GLOTRAC, GLOTRAC Station 1, and C-band radar. The final powered flight trajectory was composed of Fixed Camera, ODOP, GLOTRAC Station 1, and telemetered guidance data in conjunction with C-band radar. GLOTRAC Station 1 and ODOP provided very reliable data for the S-IB powered flight and a small portion of the S-IVB powered flight. When available, both systems were used extensively in constructing the final trajectory.

At S-IVB/CSM separation (844.95 sec) the vehicle had a space-fixed velocity 0.8 m/s (2.6 ft/s) greater than nominal. The altitude was 1.4 km (0.8 nm) greater than nominal and the flight path angle was greater than nominal.

## 1.0 INTRODUCTION

The AS-201 vehicle was launched from Cape Kennedy on February 26, 1966 at 11:12:01 Eastern Standard Time. Approximately 10 min and 3 sec after launch, the S-IVB stage's J-2 engine was shut down and the S-IVB stage and Apollo spacecraft went into a period of free flight. After approximately 4 min of free flight, S-IVB/CSM separation occurred and the Apollo spacecraft performed several maneuvers.

AS-201 was the initial flight test of the S-IB and S-IVB stages of the Saturn IB vehicle. This was also the first flight test of the Apollo spacecraft.

This report presents the postflight mass point trajectory in tabular form, from guidance reference release to S-IVB/CSM separation, in Tables VI through XI. Several parameters at S-IVB/CSM separation are included in Table V. A few points from the spacecraft trajectory as determined by MSC are included in Appendix B.

All times in this report are referenced to Range Zero (11:12:01 Eastern Standard Time) unless otherwise specified. The time of first motion was determined as 0.11 sec after Range Zero. This time was defined by stub fin displacement measurements. Guidance reference release time was determined to be 5.038 sec before Range Zero, by comparing accelerometer data telemetered in range time with data from the guidance computer which is telemetered in computer time.

Acknowledgment is given to the Data Reduction Branch of the Computation Laboratory for their support in the preparation of the tabulated trajectory data.

## 2.0 COORDINATE SYSTEMS AND TRAJECTORY PARAMETERS

The translational displacement of the vehicle's center of gravity is tabulated in several coordinate systems (described in Appendix A). An initial displacement of 32 m (105 ft) locates the vehicle's center of gravity in the coordinate system whose origin lies on the reference ellipsoid.

The representative model for the earth and its gravitational field is the Fischer Ellipsoid of 1960. All latitude and longitude coordinates are defined with respect to this ellipsoid.

The geographic coordinates and gravity data for launch pad 34 at Cape Kennedy are:

Geodetic Latitude	28.521963 deg N
Longitude	80.561141 deg W
Acceleration of Gravity	9.818 m/s <sup>2</sup> (32.31 ft/s <sup>2</sup> )

Elevations above the reference ellipsoid are:

Base of launch pedestal	5.7 m (18.7 ft)
C.G. at first motion	32.0 m (105.0 ft)
Launch Azimuth	100.0 deg E of N
Flight Azimuth	105.0 deg E of N
ST-124M Platform Azimuth	105.0 deg E of N

### 3.0 POWERED FLIGHT TRAJECTORY ANALYSIS

#### 3.1 Data Sources

Tracking data were available from liftoff through S-IVB cutoff. The times of tracking systems coverage are illustrated in Figure 1 and itemized in Table 1.

The usual difficulty in maintaining track during first stage cutoff and separation was not experienced on this flight.

##### 3.1.1 Antenna Locations

The antenna locations for the various tracking systems and the vehicle's center of gravity versus time are shown in Figure 2. The tracking data used in establishing the reference trajectory were transformed from their reference points (antenna locations) to the vehicle's center of gravity. This was done to provide a common reference point for all tracking systems.

##### 3.1.2 GLOTRAC

AS-201 was the sixth engineering test of the GLOTRAC system on a Saturn vehicle. The reduced metric data from the GLOTRAC system were received too late to be used in establishing the reference trajectory. The data received were continuous from 29.5 sec through the entire powered flight, making GLOTRAC the only high precision system that provided continuous data during the S-IVB powered flight. Comparisons between GLOTRAC and the reference trajectory are shown in Figure 6 through 8. These comparisons in the earth-fixed plumline coordinate

system show maximum deviations by S-IVB cutoff of 55 m (180 ft) in XE, 160 m (525 ft) in YE, and 95 m (312 ft) in ZE.

### 3.1.3 ODOP

Data from the ODOP tracking system were available from 1.0 to 108.3 seconds. The ODOP system had difficulty in maintaining track from 64 to 71 seconds. In the final ODOP reduction, observations from the GLOTRAC Station I data were included during this interval in order to provide continuous data. The ODOP data were used in establishing the reference trajectory from 27 to 100 seconds. During this portion of powered flight, the ODOP data are of very high quality. Comparisons between ODOP and the reference trajectory are shown in Figures 6 through 8. The deviations between ODOP and the reference trajectory are negligible.

### 3.1.4 GLOTRAC Station I

GLOTRAC Station I furnished an independent set of high quality tracking data from 21 to 250 seconds. Comparisons between GLOTRAC Station I and the reference trajectory (Figures 6 through 8) show maximum deviations of approximately 10 m (33 ft) in the XE and ZE components and 40 m (131 ft) in the YE component.

### 3.1.5 RADAR

The Grand Bahama (3.16) radar was the only FPS-16 radar to provide reliable powered flight data on the AS-201 vehicle. Comparisons of the measured parameters with the reference trajectory are shown in Figures 3 through 5. The angles show good agreement while the range shows a maximum deviation of 50 m (164 ft).

AS-201 was the third Saturn vehicle for which reliable tracking data were received from the Grand Bahama (3.18) radar. Comparisons with the reference trajectory are presented in Figures 3 through 5. The comparisons show an average deviation of less than .02 deg in azimuth and .04 deg in elevation. The maximum deviation in range is 70 m (230 ft).

Patrick (0.18) radar furnished data for nearly the entire powered flight. Comparisons with the reference trajectory are shown in Figures 3 through 5. The sharp discontinuity in range and the steep slope in the angles can be attributed to a change from skin track to beacon track. After acquisition of beacon track, the azimuth shows a .01 deg bias and the range has a maximum deviation of 50 m (164 ft).

Antigua (91.18) radar provided data very consistent with the reference trajectory. The azimuth and range measurements showed biases of .006 deg and 5 m (16 ft), respectively, while the maximum deviation in elevation was approximately .009 deg. Comparisons with the reference trajectory are shown in Figures 3 through 5.

The Grand Turk (7.18) radar data were about the same quality as the last Saturn vehicle with the exception of the range measurement. The range data on SA-10 were biased approximately 50 m (164 ft), whereas on AS-201 the range attains a maximum deviation of 40 m (131 ft). Comparisons with the reference trajectory are shown in Figures 3 through 5.

The Merritt Island (19.18) radar provided data from approximately 10 to 475 seconds. The angle data were in excellent agreement with the reference trajectory with the exception of a very large and unexplained deviation in elevation prior to 100 seconds. The maximum deviation in range is 45 m (148 ft). Comparisons with the reference trajectory are shown in Figures 3 through 5.

### 3.2 Trajectory Composition

External tracking systems data were used in conjunction with telemetered guidance velocities in establishing the reference trajectory. The trajectory was constructed in the following manner.

<u>Interval (sec)</u>	<u>Description</u>
0.0 - 27.0	Fixed Camera and ODOP were used in a least squares curve fit. The differences between the resulting curve and the actual data were negligible. (Reference I discusses in detail the method used to establish this portion of the trajectory.)
27.0 - 100.0	ODOP data processed by the smoothing and differentiation program (a discussion of the smoothing and differentiation program is contained in the following paragraphs).
100.0 - 135.0	GLOTRAC Station I processed by the smoothing and differentiation program.
135.0 - 165.0	Adjusted telemetered guidance
165.0 - 844.95	A best estimate type trajectory was determined with the MARLOCK program using a composite of telemetered guidance velocity data and C-band radar. (The following paragraphs include a brief discussion of the MARLOCK program.)

Since the trajectory was constructed from several different sources, it was necessary to provide for a merging or blending process to compensate for small biases that existed between the data from the various sources. A merging program (a least squares technique) was used to connect the data from the different sources without creating a sharp transient.

The MARLOCK trajectory construction program uses the telemetered guidance velocity data as the generating parameter to compute a trajectory which will best fit the tracking observations, yet retain the smoothness of the guidance data. The guidance data can vary only in accordance with an eighteen-term guidance error model and the variances assigned to each term. Radar measured parameters, GLOTRAC Station I measured parameters and earth-fixed Cartesian position data may be used as observations with weights being assigned to each parameter. The guidance error terms are determined using the Kalman linear filtering technique and the guidance error terms are applied to the telemetered guidance data to yield the final smooth and continuous best estimate type trajectory.

On AS-201 the ODOP and GLOTRAC Station I, Cartesian data were used as observations during the S-IB powered flight. C-band radar measured parameters were used during the S-IVB powered flight.

The ODOP, GLOTRAC Station I and computed trajectory earth-fixed Cartesian data were smoothed over a 10 sec span using coefficients which are the average of fourth-degree and second-degree smoothing coefficients. These coefficients have a frequency response which make them very desirable for tracking data filtering. The velocity and acceleration data were obtained using fourth-degree coefficients because significant bias would be induced if the average derivative coefficients were used. A more detailed discussion of the smoothing and differentiation technique may be found in Reference 2.

### 3.2.1 First Motion Time

A first motion time of 0.11 sec was determined from pad measurements 32-B01 and 32-B02 (Displacement at Stub Fins I and III).

### 3.2.2 Powered Flight Trajectory

Table II presents a comparison of actual and nominal times of some of the vehicle events in sequential order. The actual altitude and surface range are shown in Figures 9 and 10, respectively, for the entire powered flight. The total inertial acceleration profiles for the S-IB powered flight and the S-IVB powered flight are shown in Figure 11.

The earth-fixed velocity vector and the angle between the earth-fixed velocity vector and the local horizontal plane are shown in Figure 12. The space-fixed velocity vector and the angle between the space-fixed velocity vector and the local horizontal plane are shown in Figure 13. Mach number and dynamic pressure are shown for S-IB powered flight in Figure 14. These parameters were calculated using measured meteorological data to an altitude of 48 km (26 nm). Above this altitude the U.S. Standard Reference Atmosphere was used.

Various trajectory parameters are given at significant times in Table III. It should be noted that apex, loss of telemetry signal and impact apply to the S-IVB stage as well as the S-IB stage. Several parameters are given for S-IB stage inboard engine cutoff (IECO), S-IB stage outboard engine cutoff (OECO) and S-IVB stage cutoff (S-IVB CO) in Table IV. The velocity gain between OECO and separation due to thrust decay was 2.0 m/s (6.6 ft/s). The velocity gain from S-IVB CO to the end of thrust decay was 7.7 m/s (25.3 ft/s), as determined by guidance.

A comparison of the actual and nominal trajectory may be found in Reference 3. The nominal AS-201 trajectory may be found in Reference 4.

The actual trajectory is presented in the metric system of units in Tables VI through VIII and in the English system of units in Table IX through XI.

### 3.3 Error Analysis of the Reference Trajectory

During the S-IB powered portion of the flight, excellent coverage was provided by ODOP and GLOTRAC Station I. These two sets of data were used to establish the majority of the reference trajectory during this portion of the flight.

Data from the various high precision tracking systems are compared in the earth-fixed plumline coordinate system with the reference trajectory in Figures 6 through 8. All data were smoothed and transferred from the point of track (antenna locations) to a common point, the vehicle's center of gravity. These curves show only the trend of the data relative to the reference trajectory. The dispersion of the various data gives an indication of the validity of the reference trajectory. During the S-IB portion of the powered flight, the differences between the reference trajectory, ODOP, GLOTRAC and GLOTRAC Station I are negligible. The only high precision system to provide continuous coverage during the S-IVB powered flight was GLOTRAC. Due to insufficient data, it cannot be determined whether or not the "hump" that appears in the comparisons is in the GLOTRAC data or in the reference trajectory. The only pertinent fact is that this occurs at approximately the time

when the GLOTRAC transmitter was being handed over from GLOTRAC Station I to Grand Turk. In any event, the maximum deviation between GLOTRAC and the reference trajectory is less than 200 m (656 ft) in any component which is within the estimated accuracy of the trajectory.

Comparisons of the radar measured parameters with the reference trajectory are shown in Figures 3 through 5. The range measurements deviate a maximum of 65 m (213 ft) from the reference trajectory. The range deviations seem to show a systematic trend from the reference trajectory. During the S-IVB portion of the powered flight all azimuth measurements agree with the reference trajectory to within .02 deg. The same is true during this portion of the flight for the elevation angle with the exception of Grand Bahama (3.18) and Patrick (0.18). The Patrick and Grand Bahama elevation deviations seem to follow a systematic trend.

An estimate of the probable total uncertainty in the powered flight reference trajectory is presented in Figure 15. At OECO the position components are probably accurate to 100 m (328 ft) and the velocity components to 0.3 m/s (1.0 ft/s); by S-IVB CO, the maximum uncertainties have increased to 300 m (984 ft) in position components and 1.0 m/s (3.3 ft/s) in velocity components.

#### 4.0 S-IB AND S-IVB STAGE FREE FLIGHT TRAJECTORIES

A theoretical free flight trajectory was computed for the discarded S-IB and S-IVB stages using initial conditions for both stages from the reference trajectory. Nominal retro-rocket performance and outboard engine decay were assumed for the S-IB stage. No radar tracking was available for either stage to confirm results obtained.

Since the attitude angles of the stages during re-entry are unknown, nominal tumbling drag coefficients were assumed. In addition, nominal coefficients of drag were used assuming the stages (1) stabilized at an angle of attack of 90 deg and (2) stabilized at an angle of attack of 0 deg. These provide the following dispersions:

##### S-IB

<u>Drag Conditions</u>	<u>Impact Range</u>	<u>Impact Time</u>
0 deg Angle of Attack	477.15 km (257.64 nm)	473.8 sec
Tumbling	465.17 km (251.17 nm)	533.1 sec
90 deg Angle of Attack	456.94 km (246.73 nm)	573.6 sec

##### S-IVB

<u>Drag Conditions</u>	<u>Impact Range</u>	<u>Impact Time</u>
0 deg Angle of Attack	8673.47 km (4683.30 nm)	1893.0 sec
Tumbling	8661.30 km (4674.73 nm)	1916.6 sec
90 deg Angle of Attack	8651.97 km (4671.69 nm)	1935.9 sec

The theoretical free flight trajectory utilizing the tumbling drag coefficient data will be considered as the actual trajectory for both stages. The impact locations relative to the launch site are shown in Figure 16. The S-IB trajectory is presented in tabular form in Tables XII (metric units) and XIII (English units). The S-IVB trajectory is presented in tabular form in Tables XIV (metric units) and XV (English units).

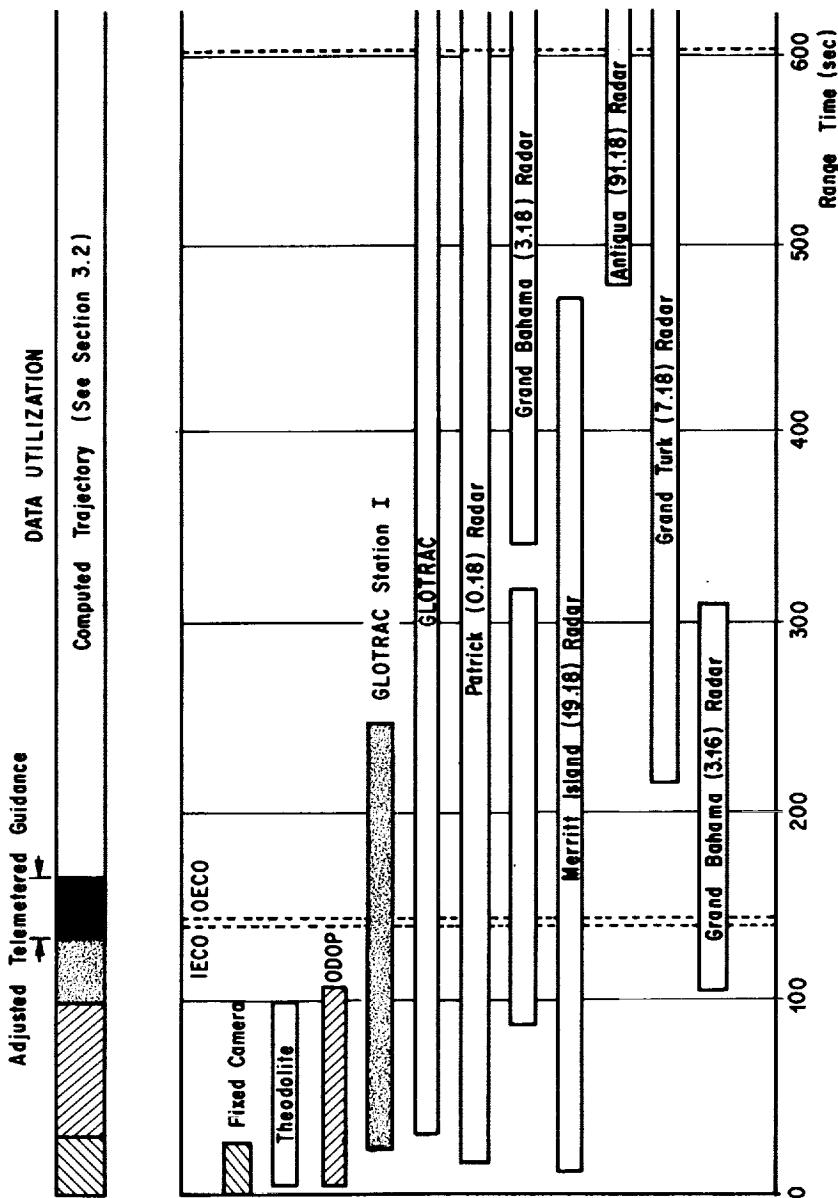


FIG. 1. AVAILABLE FINAL TRACKING DATA (POWERED FLIGHT)

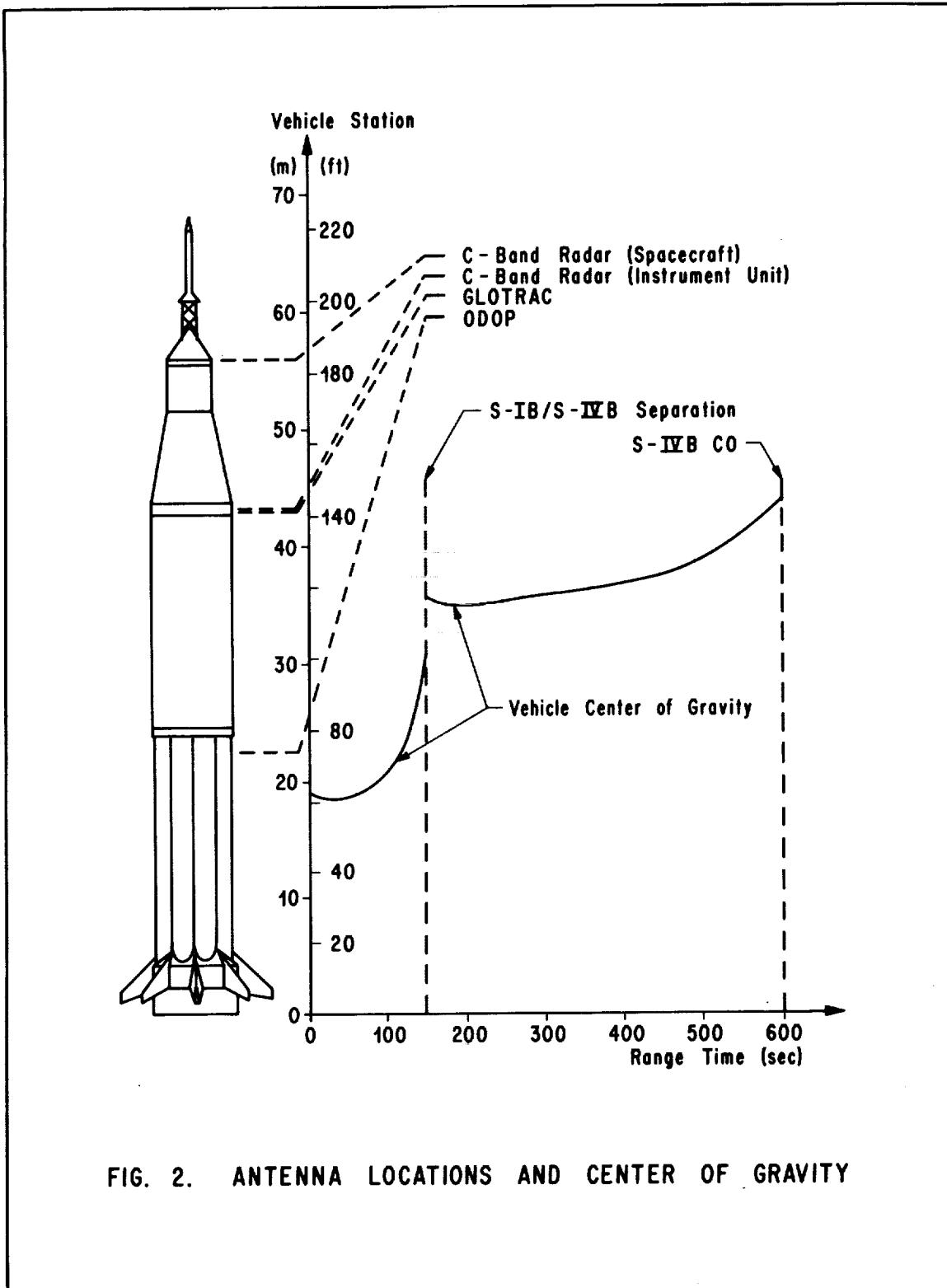


FIG. 2. ANTENNA LOCATIONS AND CENTER OF GRAVITY

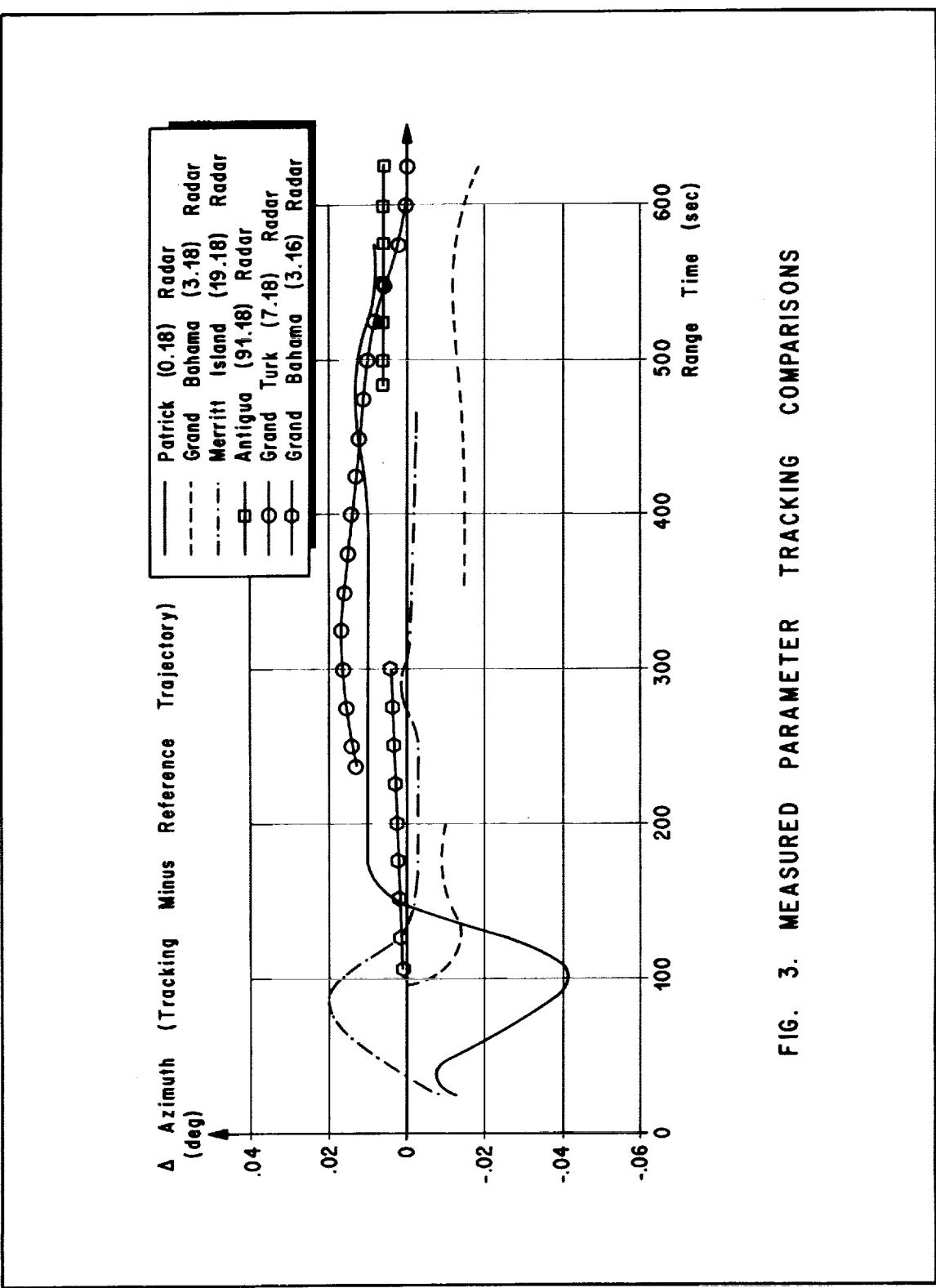


FIG. 3. MEASURED PARAMETER TRACKING COMPARISONS

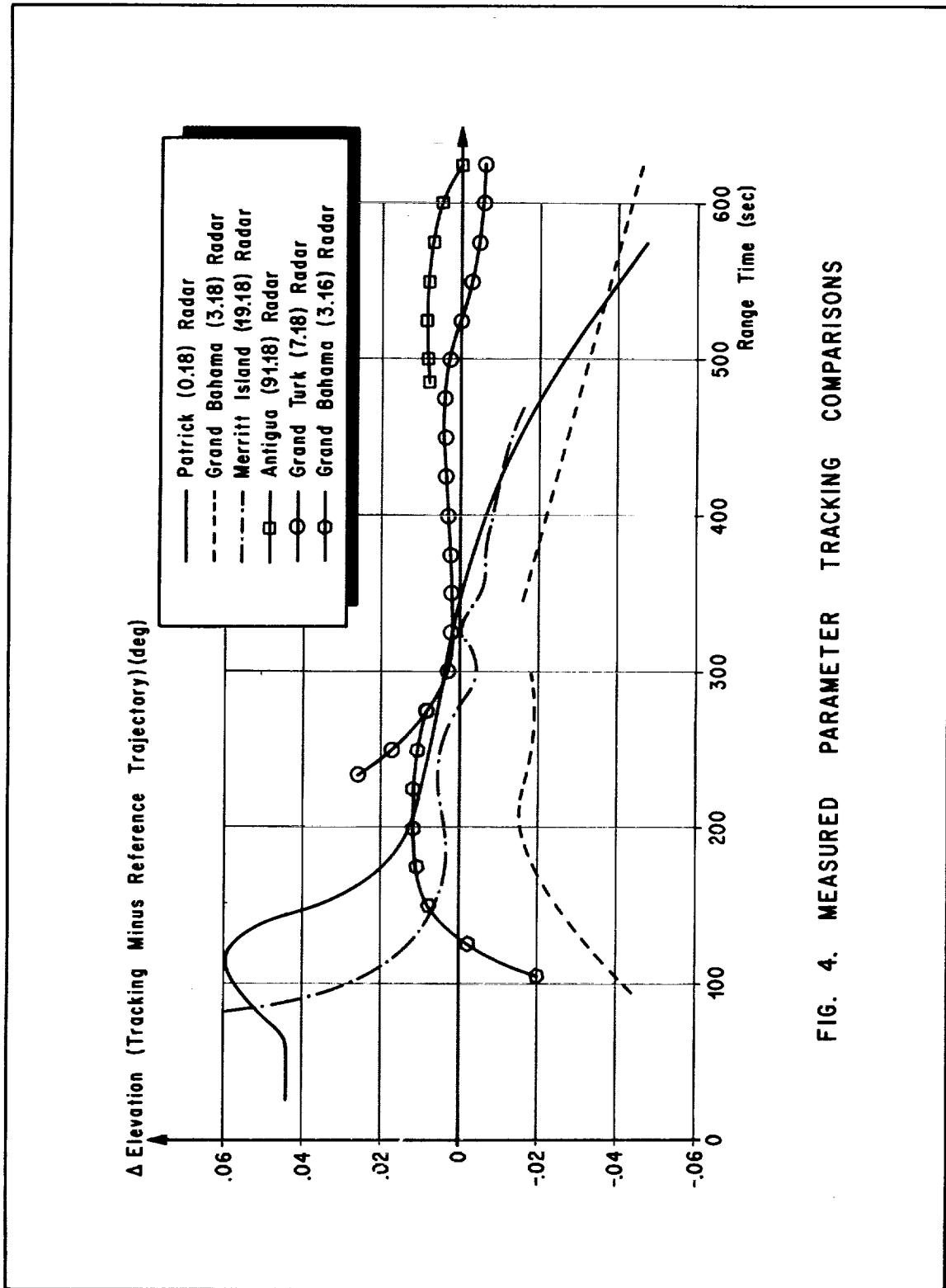


FIG. 4. MEASURED PARAMETER TRACKING COMPARISONS

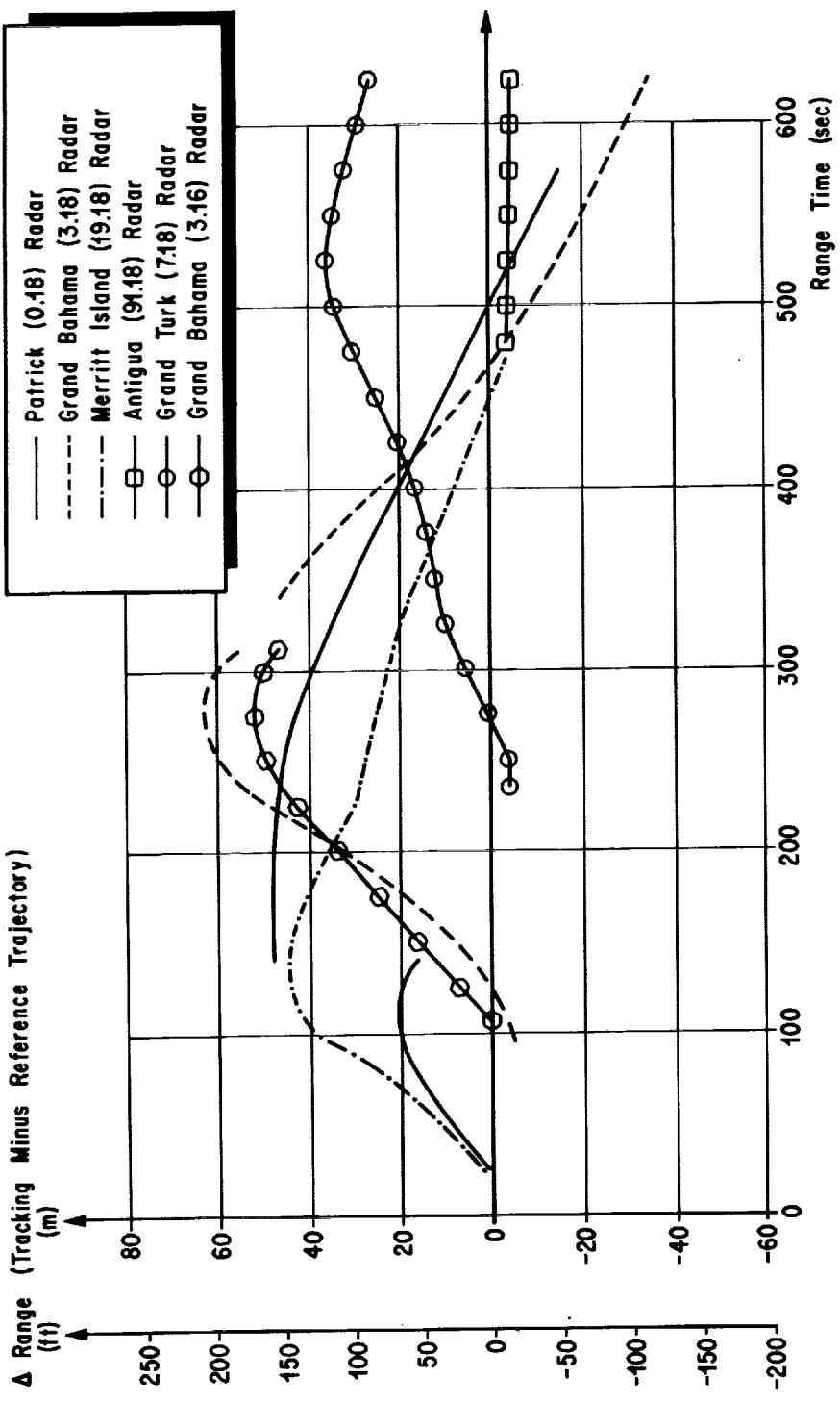


FIG. 5. MEASURED PARAMETER TRACKING COMPARISONS

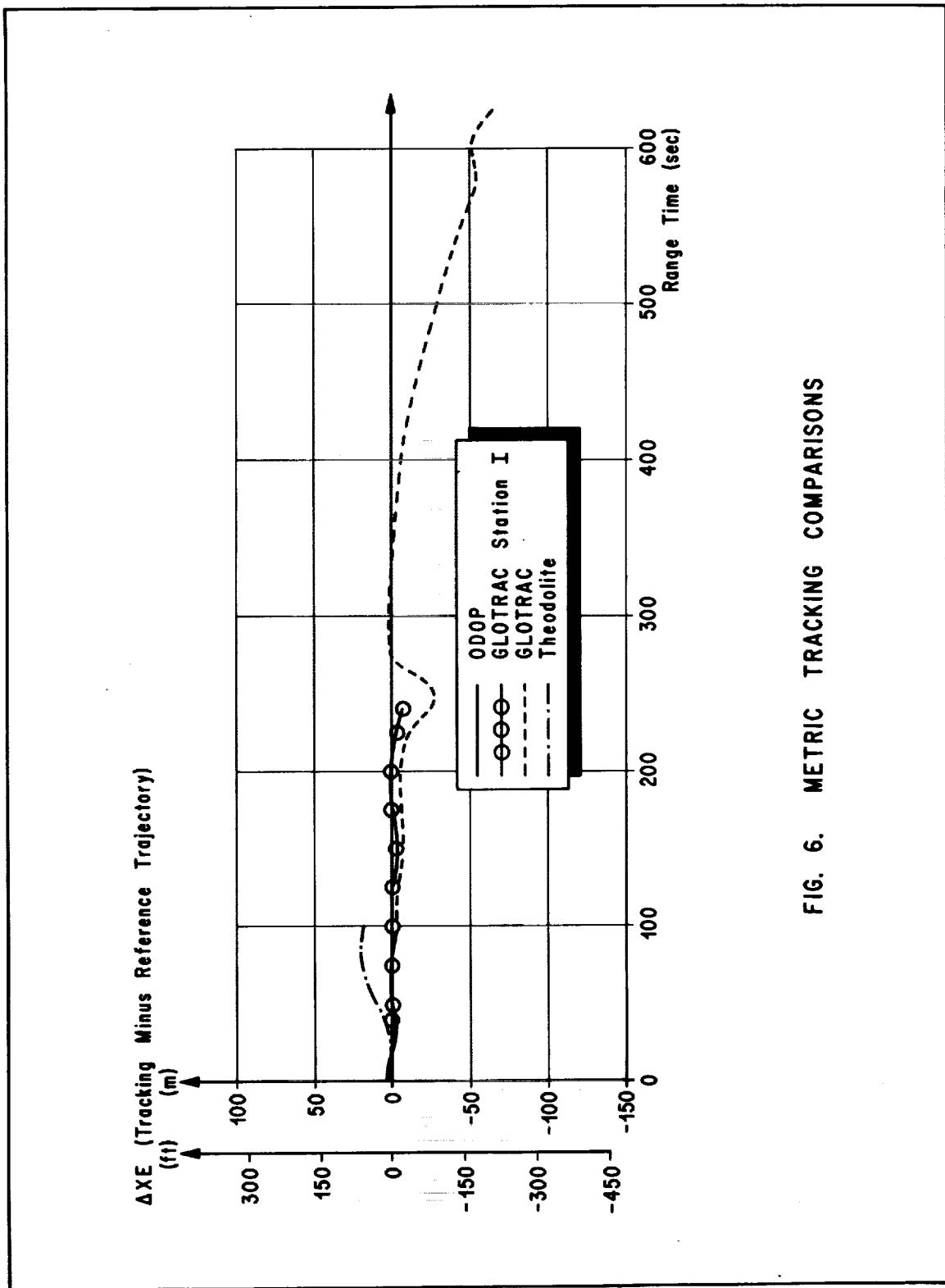


FIG. 6. METRIC TRACKING COMPARISONS

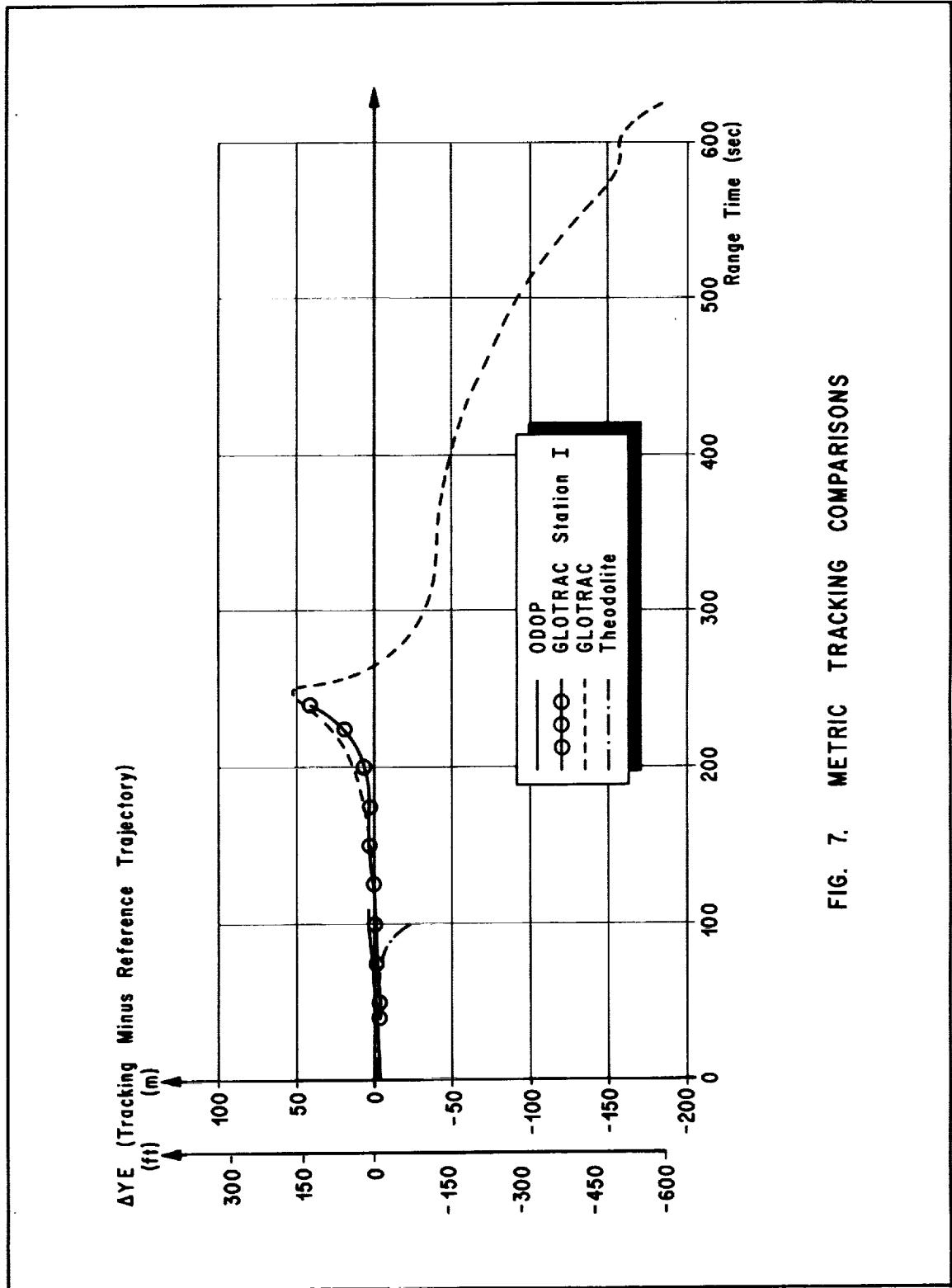


FIG. 7. METRIC TRACKING COMPARISONS

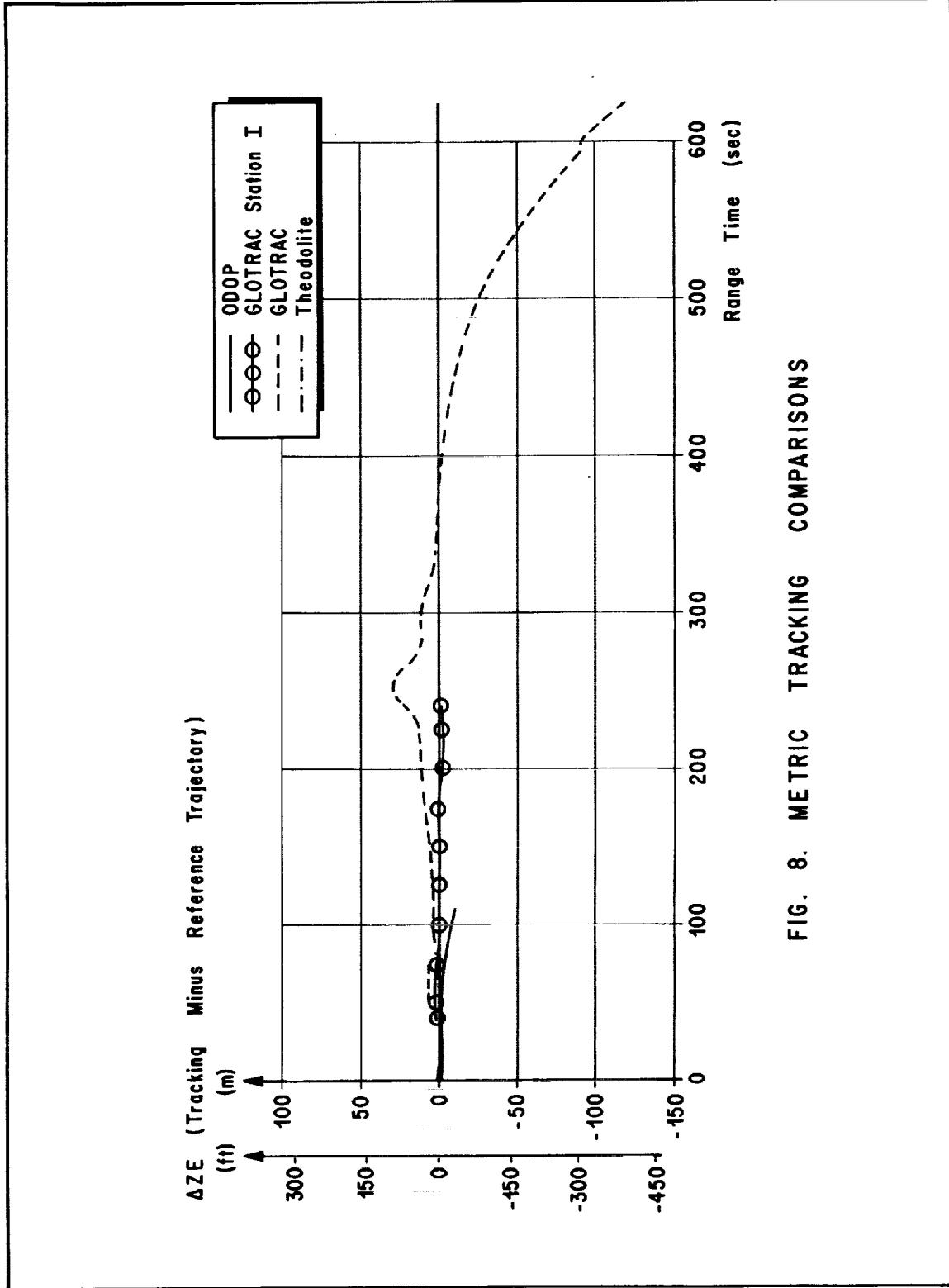


FIG. 8. METRIC TRACKING COMPARISONS

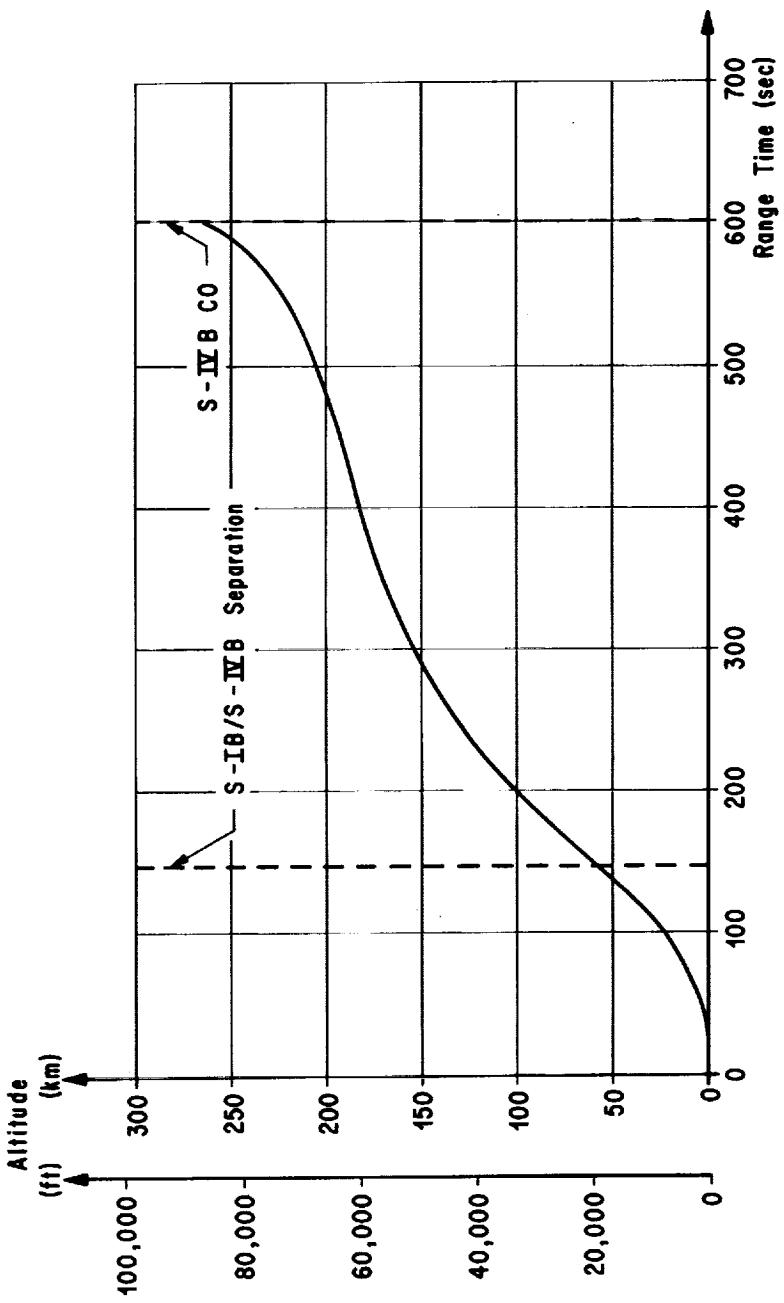


FIG. 9. ALTITUDE

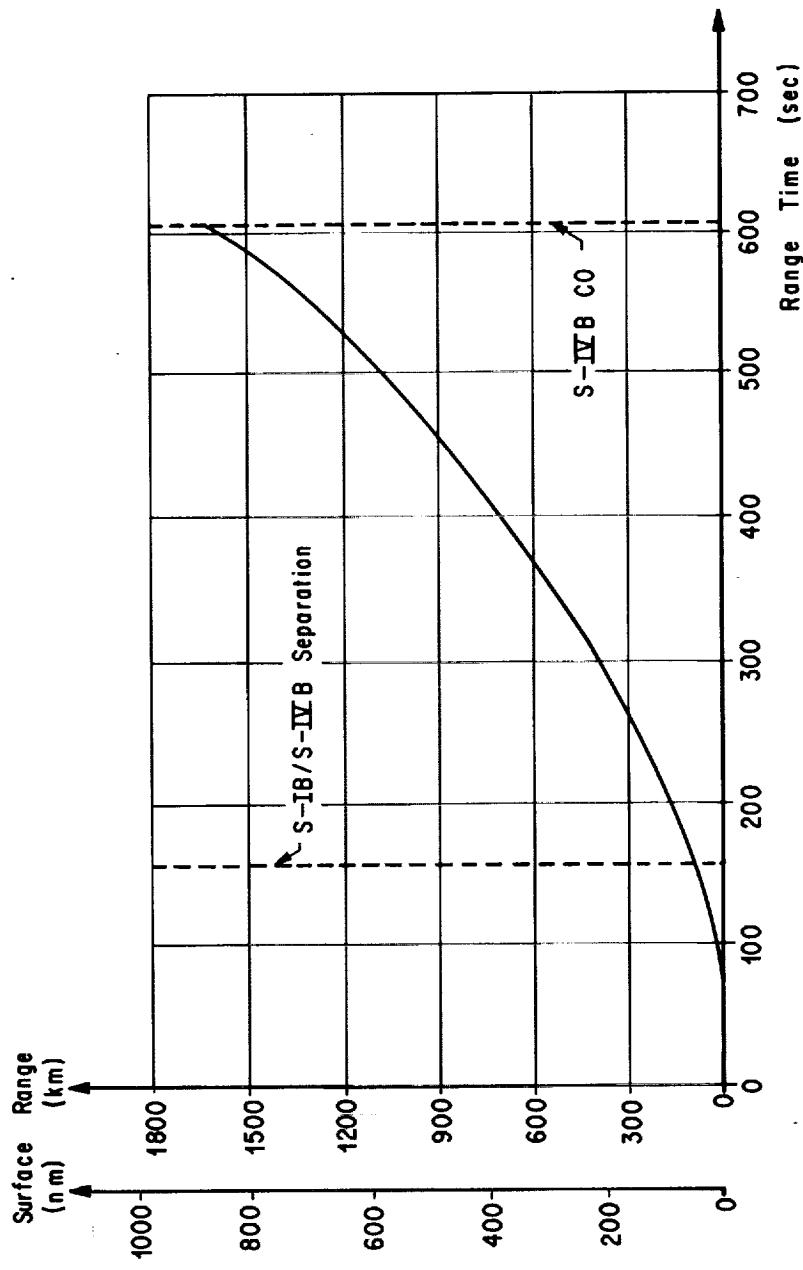


FIG. 10. SURFACE RANGE

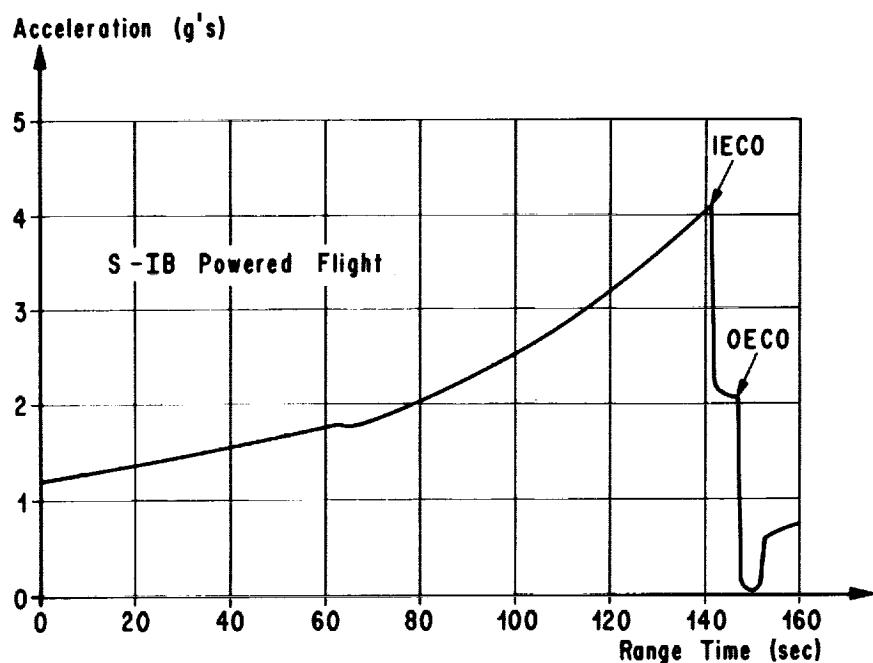
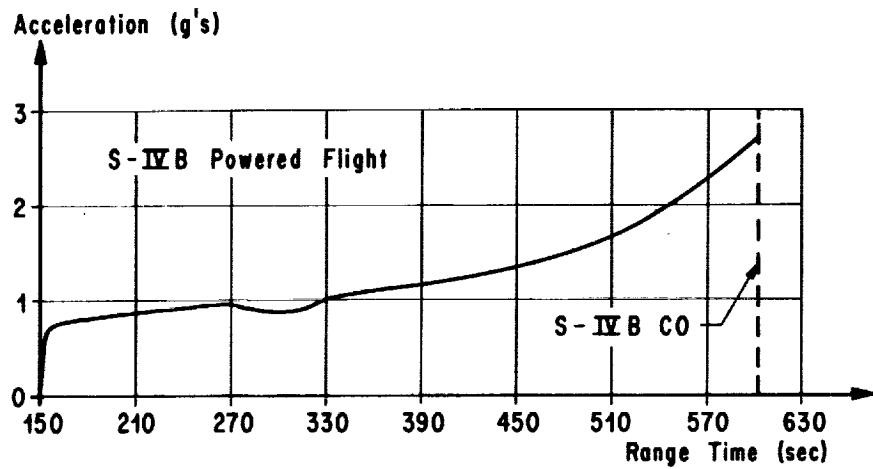
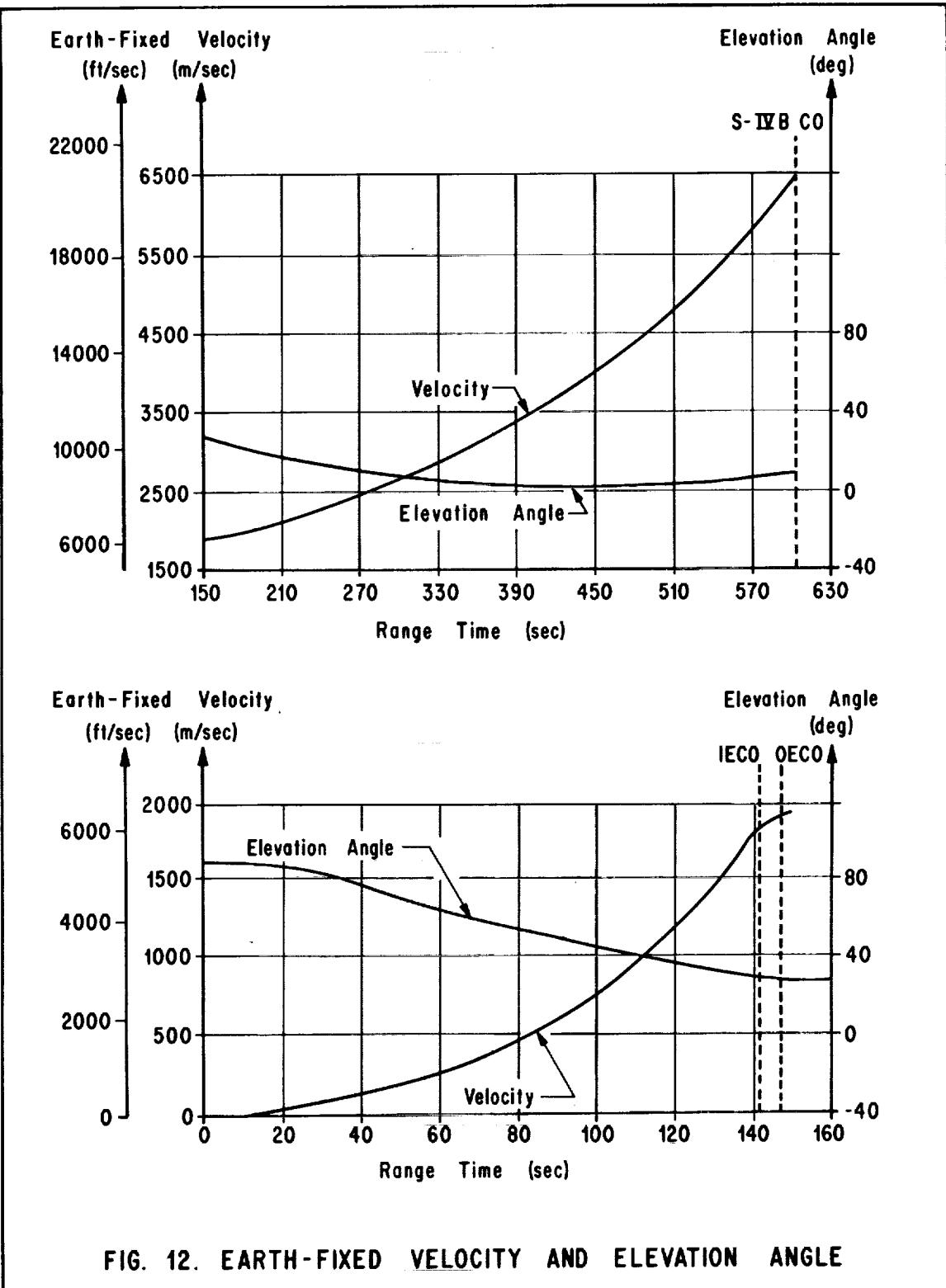


FIG. 11. TOTAL INERTIAL ACCELERATION



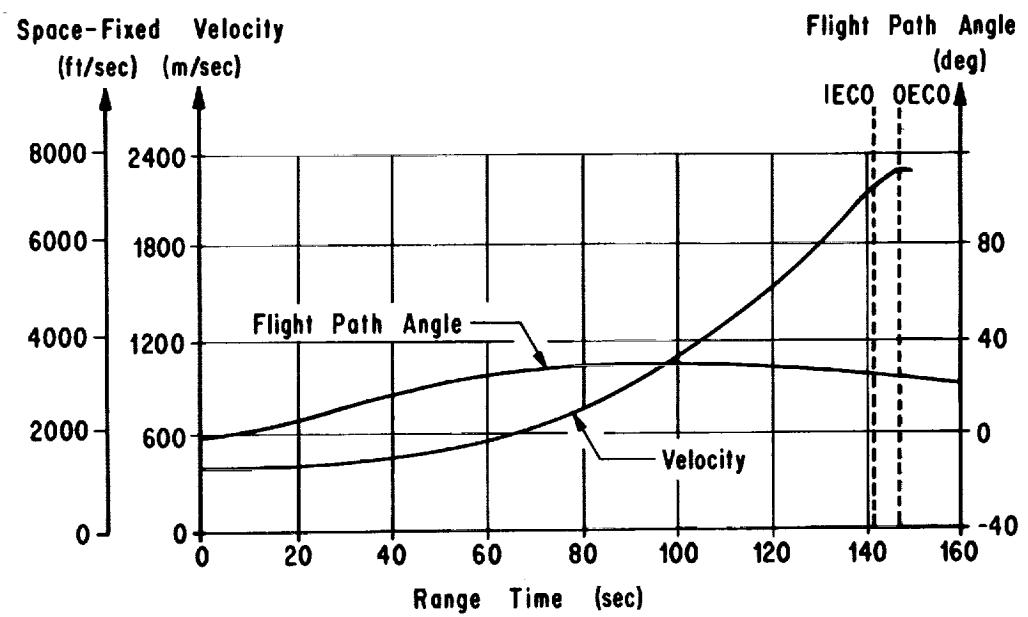
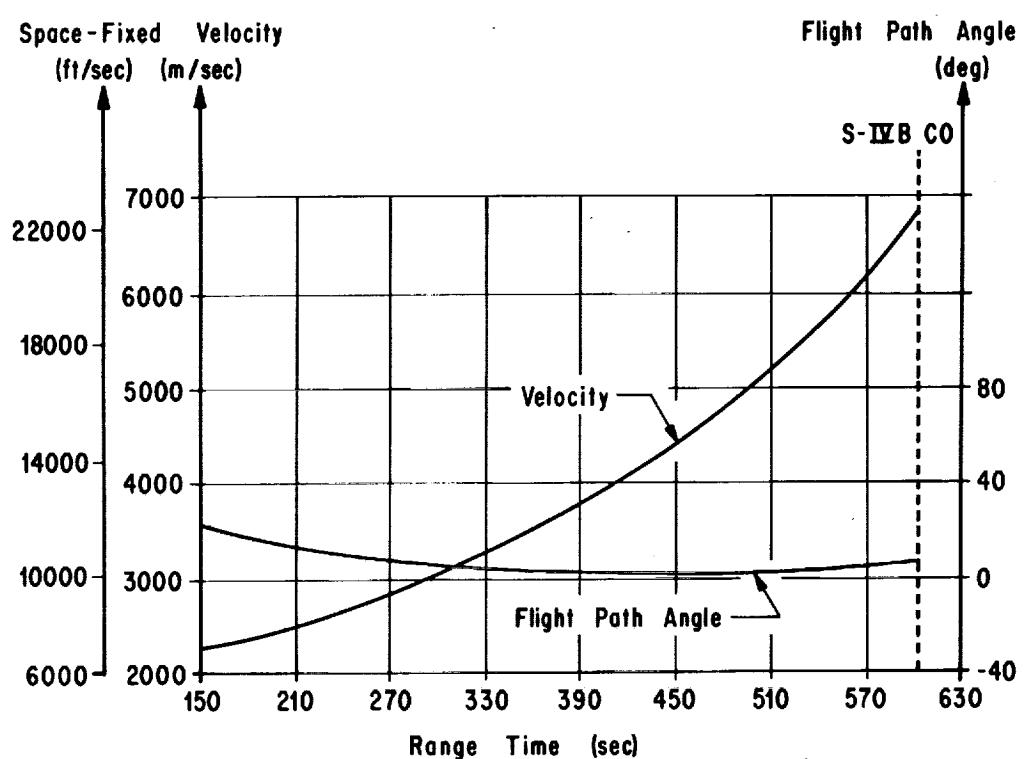


FIG. 13. SPACE-FIXED VELOCITY AND FLIGHT PATH ANGLE

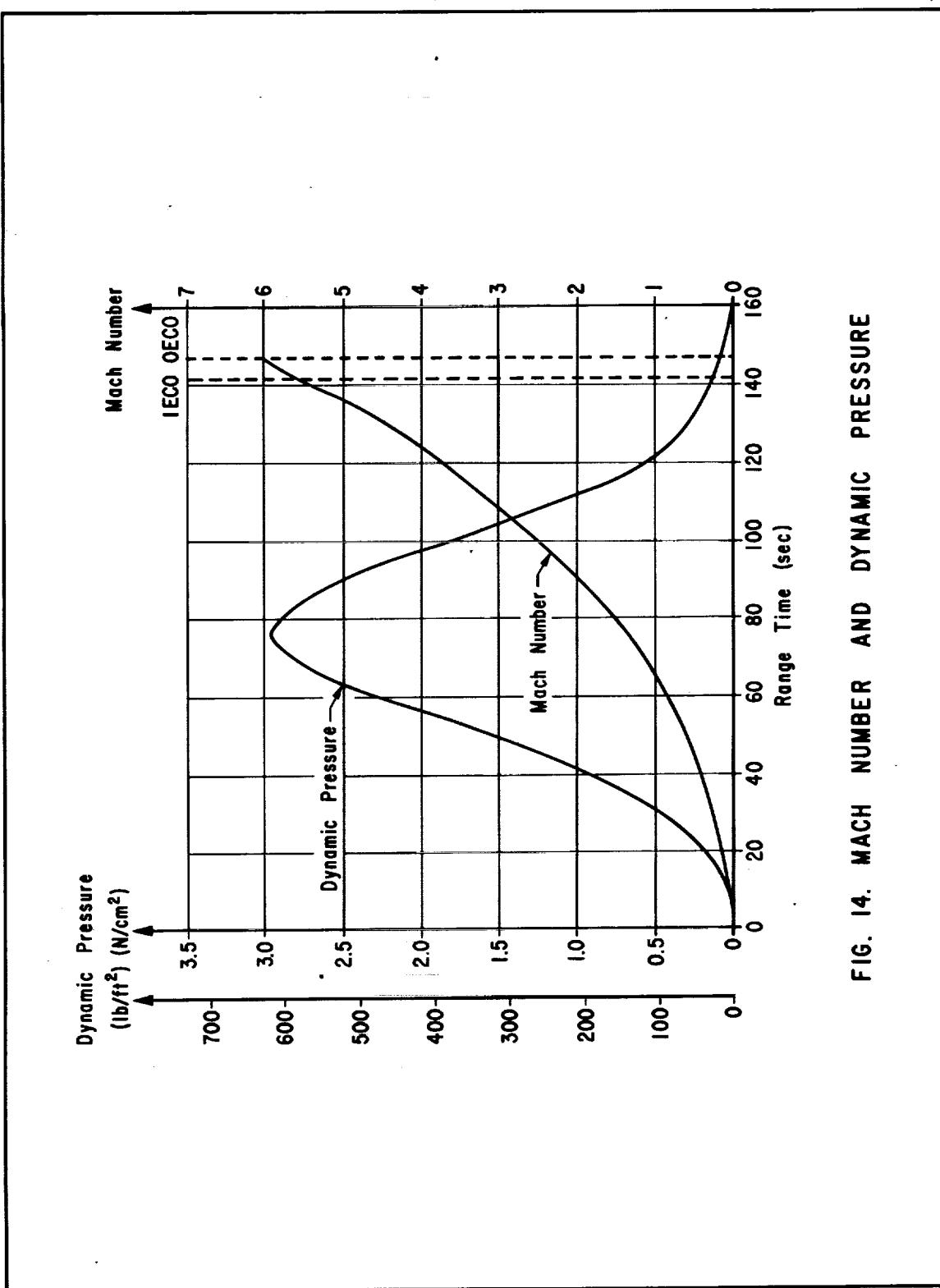


FIG. 14. MACH NUMBER AND DYNAMIC PRESSURE

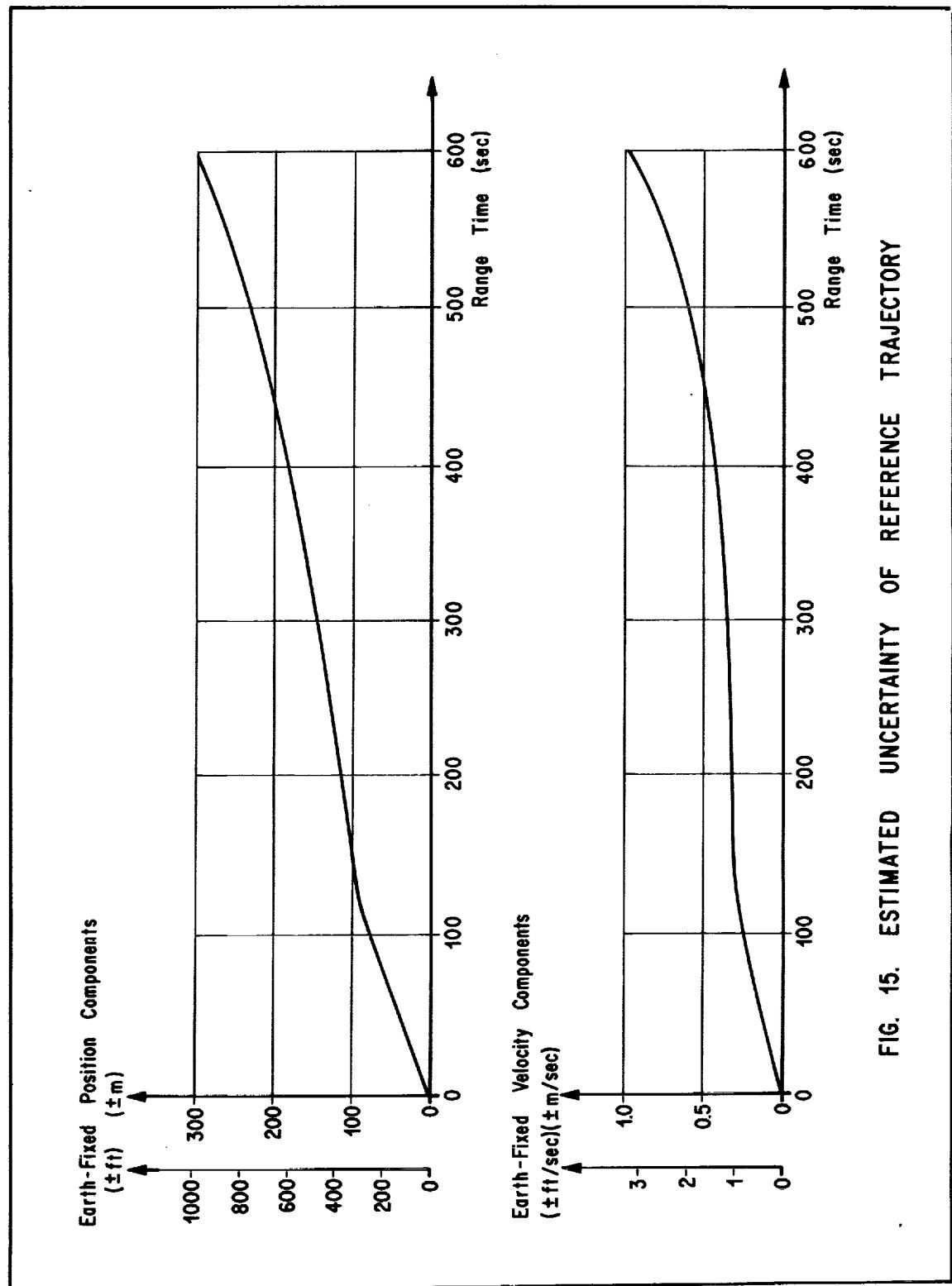


FIG. 15. ESTIMATED UNCERTAINTY OF REFERENCE TRAJECTORY

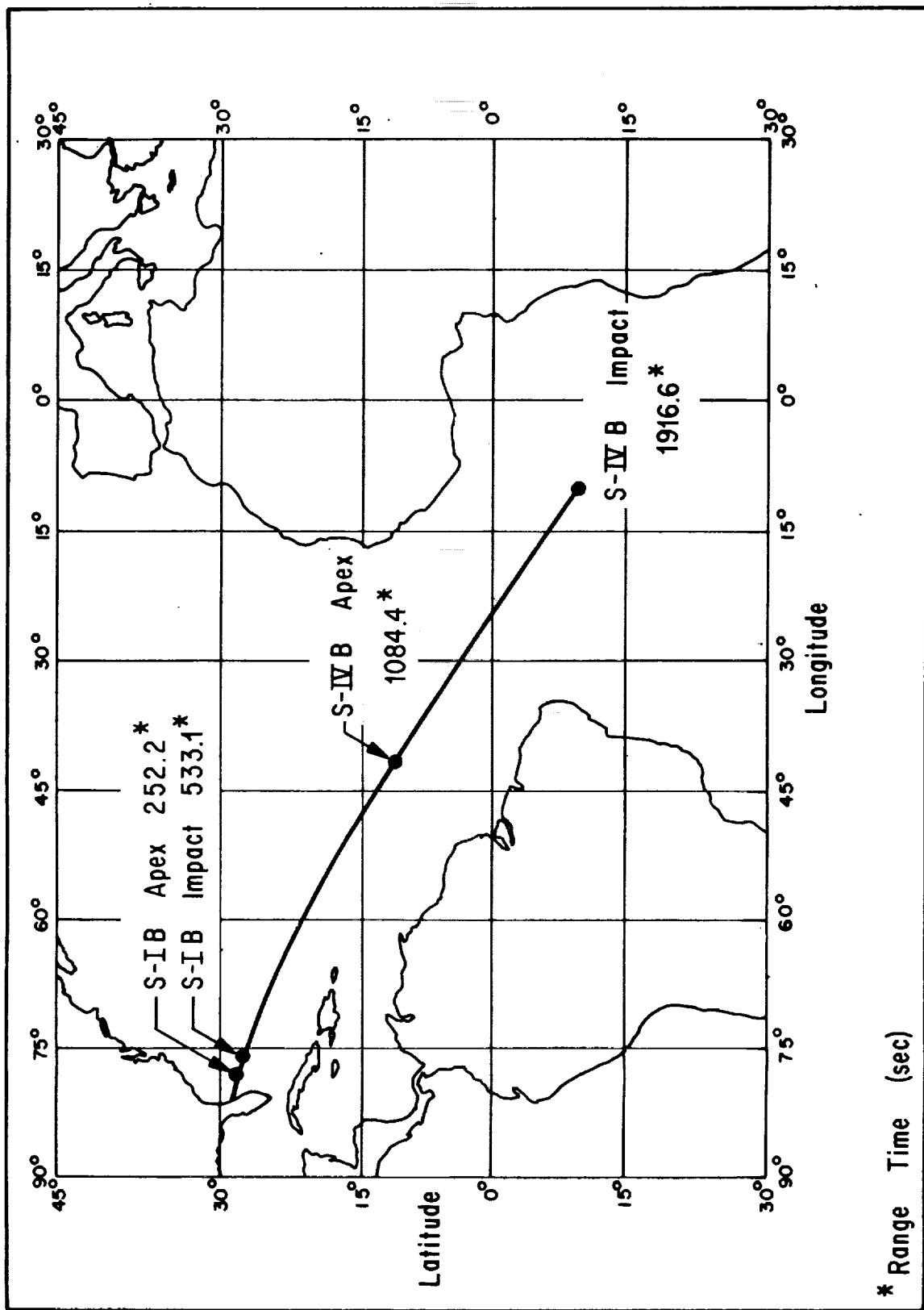


FIG. 16. S-IIB AND S-IVB STAGES GROUND TRACK

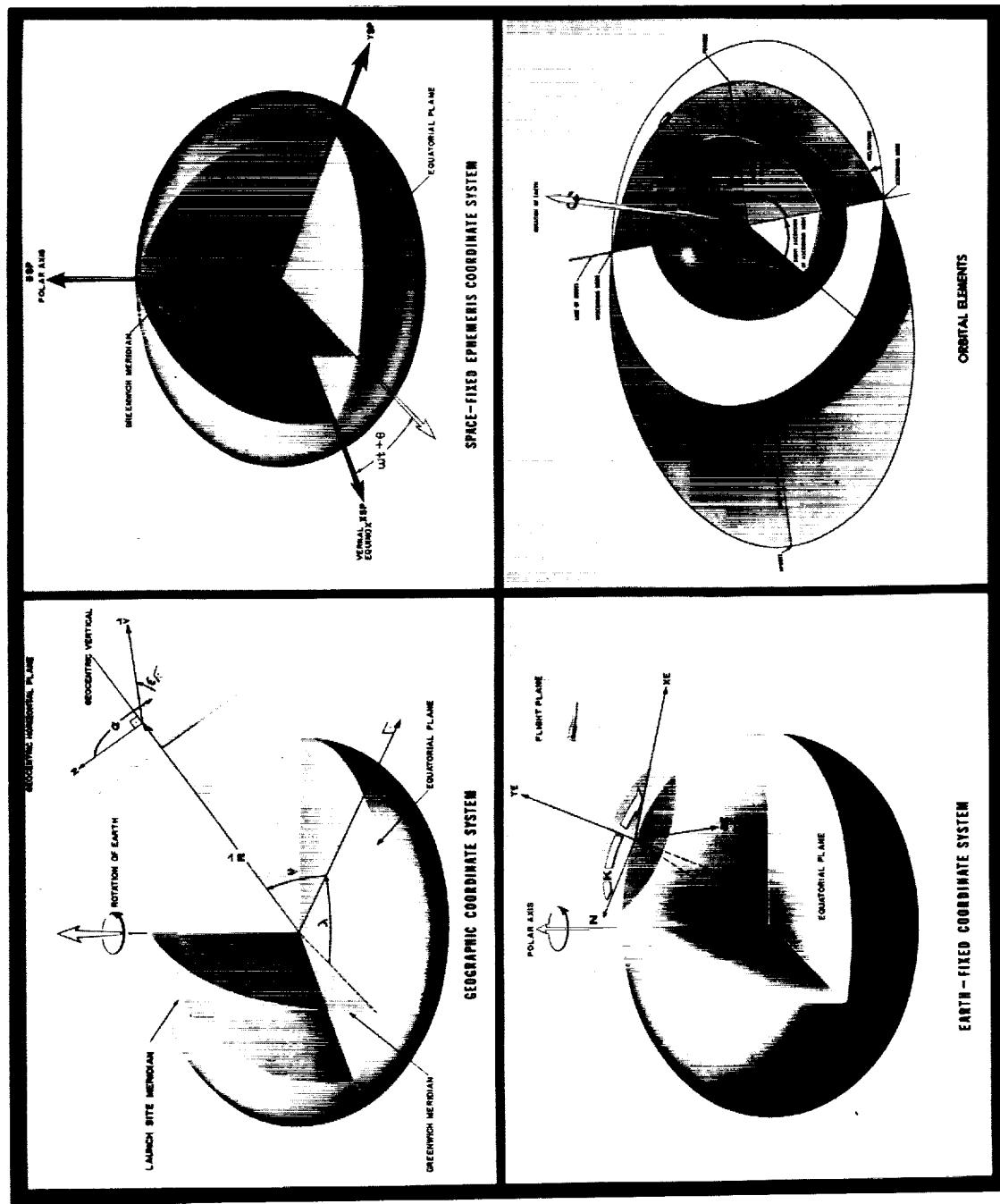


FIG. 17. TRAJECTORY COORDINATE SYSTEMS

TABLE I  
TRACKING DATA SOURCES (POWERED FLIGHT)

<u>Data Source</u>	<u>Time Available (sec)</u>
Fixed Camera	0.3 - 27.3
Theodolite	2.8 - 100.0
ODOP	1.0 - 108.3
GLOTRAC Station 1	21.0 - 250.0
GLOTRAC	29.5 - 615.0
Patrick (0.18) Radar (FPQ-6)	14.0 - 615.0
Grand Bahama (3.18) Radar (TPQ-18)	88.0 - 317.0
	343.0 - 615.0
Antigua (91.18) Radar (FPQ-6)	478.0 - 615.0
Grand Turk (7.18) Radar (TPQ-18)	216.0 - 615.0
Grand Bahama (3.16) Radar (FPS-16)	106.0 - 312.0
Merritt Island (19.18) Radar (TPQ-18)	10.0 - 474.0

TABLE II  
TIMES OF EVENTS

<u>Event</u>	<u>Actual</u>	<u>Range Time</u>	<u>Act-Nom</u>
		<u>Nominal</u>	
Guidance Reference Release	-5.038		
First Motion	.11		
Liftoff Signal	.37		
Pitch Command	11.20	10.31	.89
Roll Command	11.20	10.31	.89
Roll Completed	20.55	19.66	.89
Tilt Arrest	134.39	136.11	-1.72
Inboard Engine Cutoff	141.46	140.97	.89
Outboard Engine Cutoff	146.94	146.57	.37
Separation	147.74	147.39	.35
S-IVB Ignition	149.35	148.98	.37
LES Jettison	172.64	172.27	.37
Introduce Guidance	176.11	175.11	1.00
Engine Mixture Ratio Shift	275.92	325.11	-49.19
Guidance Cutoff Signal	602.86	592.73	10.13
S-IVB/CSM Separation	844.95	834.41	10.54

TABLE III  
SIGNIFICANT TRAJECTORY PARAMETERS

<u>Event</u>	<u>Parameter</u>	<u>Actual Value</u>
First Motion	Range Time	11 sec
	Total Inertial Acceleration	11.75 m/s <sup>2</sup> (38.55 ft/s <sup>2</sup> )
Mach 1	Range Time	65.5 sec
	Altitude	7.86 km (4.24 nm)
Maximum Dynamic Pressure	Range Time	76.0 sec
	Dynamic Pressure	2.95 N/cm <sup>2</sup> (616.3 lb/ft <sup>2</sup> )
	Altitude	11.26 km (6.08 nm)
Maximum Total Inertial Acceleration (S-IB Stage)	Range Time	141.56 sec
	Acceleration	40.05 m/s <sup>2</sup> (131.4 ft/s <sup>2</sup> )
Maximum Earth-Fixed Velocity (S-IB Stage)	Range Time	147.24 sec
	Velocity	1930.25 m/s (6332.84 ft/s)
Apex (S-IB Stage)	Range Time	252.1 sec
	Altitude	107.22 km (57.89 nm)
	Surface Range	233.29 km (125.97 nm)
	Earth-Fixed Velocity	1637.10 m/s (5371.06 ft/s)
Loss of Telemetry (S-IB Stage)	Range Time	383.0 sec
	Altitude	32.9 km (17.8 nm)
	Surface Range	443.0 km (239.2 nm)
	Total Earth-Fixed Acceleration	-40.7 m/s <sup>2</sup> (-133.5 ft/s <sup>2</sup> )
	Elevation Angle From Pad	2.25 deg

TABLE III (CONT'D)

<u>Event</u>	<u>Parameter</u>	<u>Actual Value</u>
<b>Impact (S-IB Stage)</b>		
Range Time	533.1 sec	
Surface Range	465.17 km (251.17 nm)	
Cross Range	6.0 km (3.2 nm)	
Geodetic Latitude	27.3078 deg	
Longitude	76.0373 deg	
Maximum Total Inertial Acceleration (S-IVB Stage)		
Range Time	602.96 sec	
Acceleration	26.74 m/s <sup>2</sup> (87.73 ft/s <sup>2</sup> )	
Maximum Earth-Fixed Velocity (S-IVB Stage)		
Range Time	603.16 sec	
Velocity	1540.06 m/s (5052.69 ft/s)	
Apex (S-IVB Stage)		
Range Time	1084.4 sec	
Altitude	492.81 km (266.10 nm)	
Surface Range	4472.89 km (2415.17 nm)	
Earth-Fixed Velocity	6226.1 m/s (20426.8 ft/s)	
Loss of Telemetry (S-IVB Stage)		
Range Time	1706.0 sec	
Altitude	107.6 km (58.10 nm)	
Surface Range	8215.9 km (4436.23 nm)	
Total Earth-Fixed Acceleration	-8.6 m/s <sup>2</sup> (-28.22 ft/s <sup>2</sup> )	
Impact (S-IVB Stage)		
Range Time	1916.6 sec	
Surface Range	8661.30 km (4676.73 nm)	
Cross Range	320.2 km (172.89 nm)	
Geodetic Latitude	-9.6621 deg	
Longitude	10.0783 deg	

TABLE IV  
CUTOFF CONDITIONS

<u>Parameters</u>	<u>OECO</u>	<u>OECO</u>	<u>S-IVB CO</u>
Range Time	141.46 sec	146.94 sec	602.86 sec
Altitude	52.86 km (28.54 nm)	58.04 km (31.34 nm)	261.25 km (141.08 nm)
Range	53.96 km (29.14 nm)	62.82 km (33.92 nm)	1622.15 km (875.96 nm)
Cross Range, ZE	.12 km (.06 nm)	.17 km (.09 nm)	39.65 km (21.41 nm)
Cross Range Velocity, DZE	8.34 m/s (27.36 ft/s)	9.42 m/s (30.91 ft/s)	215.81 m/s (708.07 ft/s)
Earth-Fixed Velocity	1836.65 m/s (6026.05 ft/s)	1927.61 m/s (6324.19 ft/s)	6534.55 m/s (21439.86 ft/s)
Earth-Fixed Velocity Vector Elevation	30.796 deg	29.488 deg	8.440 deg
Earth-Fixed Velocity Vector Azimuth	105.464 deg	105.528 deg	113.624 deg
Space-Fixed Velocity	2190.72 m/s (7187.75 ft/s)	2285.32 m/s (7498.13 ft/s)	6939.54 m/s (22768.63 ft/s)
Total Inertial Acceleration	40.02 m/s <sup>2</sup> (131.31 ft/s <sup>2</sup> )	20.33 m/s <sup>2</sup> (66.70 ft/s <sup>2</sup> )	26.72 m/s <sup>2</sup> (87.67 ft/s <sup>2</sup> )
Earth-Fixed Velocity Accuracy	Altitude Accuracy		
OECO	+0.3 m/s (+1.0 ft/s)	+100 m (+328 ft)	
S-IVB CO	<u>+0.7 m/s</u> ( <u>+2.3 ft/s</u> )	<u>±200 m</u> ( <u>±656 ft</u> )	

TABLE V  
S-IVB/CSM SEPARATION CONDITIONS

<u>Parameter</u>	<u>Parameter Value</u>
Range Time	844.95 sec
Altitude	435.43 km (235.11 nm)
Range	3081.72 km (1664.00 nm)
Cross Range, ZE	101.09 km (54.58 nm)
Cross Range Velocity, DZE	284.1 m/s (932.1 ft/s)
Heading Angle	116.931 deg
Flight Path Angle	4.138 deg
Space-Fixed Velocity	6721.1 m/s (22050.9 ft/s)

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M/S	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
<b>GUIDANCE REFERENCE RELEASE</b>									
-5.038	0	32	0	0.0	0.0	0.0	0.00	0.00	0.00
0.0	0	32	0	0.0	0.0	0.0	0.00	0.00	0.00
<b>FIRST MOTION</b>									
0.110	0	32	0	-0.0	-0.0	-0.0	-0.33	1.96	-0.07
<b>LIFTOFF SIGNAL</b>									
0.370	0	32	0	-0.1	0.5	-0.0	-0.25	2.00	-0.05
1.0	0	33	0	-0.2	1.8	-0.0	-0.10	2.08	-0.02
2.0	0	36	0	-0.2	3.9	-0.0	0.04	2.19	0.01
3.0	0	41	0	-0.1	6.2	-0.0	0.09	2.27	0.03
4.0	-0	48	0	-0.0	8.5	0.0	0.09	2.35	0.04
5.0	-0	58	0	0.0	10.9	0.0	0.07	2.42	0.04
6.0	-0	70	0	0.1	13.3	0.1	0.03	2.48	0.04
7.0	0	84	0	0.1	15.8	0.1	-0.01	2.54	0.03
8.0	0	101	0	0.1	18.4	0.1	-0.04	2.60	0.03
9.0	0	121	0	0.0	21.0	0.2	-0.05	2.66	0.03
10.0	0	143	1	-0.0	23.7	0.2	-0.04	2.73	0.02
11.0	0	169	1	-0.0	26.5	0.2	-0.02	2.80	0.02
12.0	0	196	1	-0.1	29.3	0.2	0.01	2.87	0.02
13.0	-0	227	1	-0.0	32.2	0.3	0.06	2.95	0.03
14.0	-0	261	2	0.1	35.2	0.3	0.11	3.03	0.03
15.0	-0	298	2	0.2	38.3	0.3	0.17	3.12	0.03
16.0	0	337	2	0.4	41.4	0.4	0.23	3.20	0.03
17.0	0	381	3	0.7	44.7	0.4	0.29	3.29	0.04
18.0	1	427	3	1.0	48.0	0.4	0.35	3.38	0.04
19.0	2	477	3	1.4	51.4	0.5	0.40	3.46	0.04
20.0	4	530	4	1.8	54.9	0.5	0.45	3.55	0.03
21.0	6	586	4	2.3	58.5	0.5	0.49	3.63	0.03
22.0	8	647	5	2.8	62.2	0.6	0.54	3.71	0.02
23.0	11	711	6	3.3	66.0	0.6	0.59	3.79	0.01
24.0	15	779	6	4.0	69.8	0.6	0.65	3.86	0.00
25.0	19	850	7	4.6	73.7	0.6	0.72	3.93	-0.01
26.0	24	926	7	5.4	77.6	0.6	0.80	4.00	-0.02
27.0	30	1006	8	6.2	81.7	0.5	0.90	4.07	-0.03
28.0	37	1090	8	7.2	85.8	1.0	1.02	4.14	-0.05

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DDYE M/S SQ	DZXE M/S	DZYXE M/S SQ	DDZXE M/S SQ
				DXE M/S	DYE M/S	DDYE M/S SQ	DZXE M/S	DZYXE M/S SQ	DDZXE M/S SQ
29.0	44	1177	9	8.3	90.0	0.5	1.17	4.21	-0.06
30.0	53	1269	9	9.6	94.2	0.4	1.33	4.28	-0.07
31.0	64	1366	10	11.0	98.5	0.3	1.51	4.35	-0.07
32.0	75	1467	10	12.6	102.9	0.3	1.70	4.42	-0.07
33.0	89	1572	10	14.4	107.4	0.2	1.89	4.49	-0.07
34.0	104	1681	10	16.4	111.9	0.1	2.06	4.57	-0.06
35.0	122	1796	10	18.4	116.6	0.0	1.95	4.63	-0.02
36.0	142	1914	10	20.4	121.2	0.1	2.09	4.77	0.05
37.0	163	2038	11	22.6	126.0	0.1	2.30	4.78	0.04
38.0	187	2166	11	24.9	130.8	0.2	2.42	4.88	0.01
39.0	213	2300	11	27.5	135.8	0.0	2.71	4.99	-0.17
40.0	242	2438	11	30.3	140.8	-0.1	2.81	4.98	-0.12
41.0	273	2581	10	33.2	145.7	-0.3	2.85	5.12	-0.11
42.0	308	2730	10	36.0	151.0	-0.3	2.98	5.20	-0.10
43.0	346	2883	10	39.2	156.2	-0.5	3.15	5.21	-0.04
44.0	386	3042	9	42.3	161.5	-0.4	3.36	5.30	-0.03
45.0	430	3206	9	45.9	166.8	-0.6	3.45	5.40	-0.10
46.0	478	3376	8	49.3	172.3	-0.6	3.70	5.42	-0.14
47.0	529	3551	7	53.2	177.7	-0.8	3.83	5.53	-0.03
48.0	584	3731	7	57.0	183.3	-0.8	4.01	5.57	-0.07
49.0	643	3917	6	61.1	188.9	-0.8	4.05	5.66	0.07
50.0	706	4109	5	65.2	194.6	-0.8	4.25	5.68	0.03
51.0	774	4307	4	69.5	200.3	-0.7	4.22	5.87	0.13
52.0	845	4510	4	73.7	206.3	-0.6	4.34	5.94	-0.04
53.0	921	4719	3	78.2	212.2	-0.7	4.53	5.97	-0.14
54.0	1001	4934	2	82.8	218.2	-0.8	4.74	6.04	-0.11
55.0	1087	5156	1	87.7	224.2	-1.0	5.13	6.04	-0.09
56.0	1177	5383	1	92.8	230.3	-1.0	5.23	6.10	-0.13
57.0	1272	5616	0	98.0	236.5	-1.2	5.34	6.18	-0.20
58.0	1373	5856	-1	103.3	242.7	-1.4	5.52	6.30	-0.25
59.0	1479	6102	-2	108.8	249.1	-1.7	5.67	6.38	-0.26
60.0	1591	6354	-4	114.5	255.5	-2.0	5.81	6.44	-0.30
61.0	1708	6612	-6	120.3	262.0	-2.3	5.97	6.44	-0.25
62.0	1832	6878	-8	126.3	268.4	-2.5	6.15	6.43	-0.10
63.0	1961	7149	-10	132.5	274.9	-2.5	6.26	6.43	0.03
64.0	2097	7427	-13	138.8	281.3	-2.4	6.34	6.41	0.03
65.0	2239	7712	-15	145.2	287.7	-2.4	6.47	6.33	-0.03
MACH BNE									
65.500	2312	7856	-16	148.4	290.8	-2.5	6.54	6.30	-0.05
66.0	2387	8002	-17	151.7	294.0	-2.5	6.61	6.27	-0.07
67.0	2542	8300	-20	158.4	300.2	-2.6	6.77	6.22	-0.06

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S			DYE M/S			DZE M/S			DDYE M/S SQ			DDZE M/S SQ		
				DXE M/S	DYE M/S	DZE M/S	DXE M/S	DYE M/S	DZE M/S	DXE M/S	DYE M/S	DZE M/S	DXE M/S	DYE M/S	DZE M/S	DXE M/S	DYE M/S	DZE M/S
68.0	2704	8603	-22	165.3	306.4	-2.7	6.93	6.20	0.01	6.93	7.07	6.30	0.02	0.01	0.01	6.20	6.30	0.02
69.0	2873	8912	-25	172.3	312.6	-2.7	7.07	6.30	0.02	7.20	6.47	6.47	-0.03	-0.03	-0.03	7.42	6.63	-0.05
70.0	3049	9228	-27	179.5	319.0	-2.7	7.40	6.63	0.05	7.40	7.70	6.77	0.01	0.01	0.01	7.70	6.86	0.09
71.0	3232	9550	-30	186.8	325.5	-2.8	7.40	6.63	0.05	7.40	7.70	6.77	0.01	0.01	0.01	7.70	6.89	0.13
72.0	3423	9879	-33	194.4	332.2	-2.9	7.40	6.77	0.01	7.40	7.99	7.99	0.09	0.09	0.09	7.99	6.94	0.03
73.0	3621	10214	-35	202.3	339.1	-2.9	7.40	6.86	0.09	7.40	8.24	8.24	0.13	0.13	0.13	8.24	8.56	0.16
74.0	3827	10557	-38	210.5	345.9	-2.8	7.40	6.89	0.13	7.40	8.56	8.56	0.16	0.16	0.16	8.56	8.72	0.19
75.0	4042	10906	-41	219.0	352.8	-2.7	7.40	6.94	0.03	7.40	8.56	8.56	0.16	0.16	0.16	8.56	8.78	0.14
MAXIMUM DYNAMIC PRESSURE																		
76.000	4266	11262	-43		227.9			359.8			-2.8	8.93		7.03		-0.24		
77.0	4498	11626	-46	237.1	366.9	-3.2	9.25	7.13	0.59	7.74	9.49	9.49	0.79	0.79	0.79	9.49	7.26	0.81
78.0	4740	11996	-50	246.6	374.0	-4.0	9.49	7.42	0.81	7.74	9.68	9.68	0.81	0.81	0.81	9.68	7.42	0.77
79.0	4991	12374	-54	256.4	381.4	-4.9	9.68	7.57	0.77	7.74	9.87	9.87	0.77	0.77	0.77	9.87	7.57	0.83
80.0	5253	12759	-59	266.3	388.8	-5.9	10.5	7.68	0.83	7.74	10.22	10.22	0.83	0.83	0.83	10.22	7.68	0.71
81.0	5524	13151	-65	276.3	396.4	-6.5	10.71	7.74	0.71	7.74	10.71	10.71	0.71	0.71	0.71	10.71	7.74	0.71
82.0	5805	13552	-72	286.8	404.2	-7.4	10.71	7.82	0.16	7.82	10.94	10.94	0.16	0.16	0.16	10.94	7.82	0.64
83.0	6098	13960	-80	297.6	411.9	-7.7	11.29	7.82	0.64	7.82	11.29	11.29	0.64	0.64	0.64	11.29	7.82	0.38
84.0	6401	14376	-87	308.8	419.8	-7.2	11.54	7.94	1.38	7.94	11.54	11.54	1.38	1.38	1.38	11.54	7.94	1.82
85.0	6715	14800	-94	320.2	427.6	-6.3	11.92	8.00	1.82	8.00	11.92	11.92	1.82	1.82	1.82	11.92	8.00	1.82
86.0	7041	15231	-99	331.9	435.7	-4.5	11.92	8.29	1.59	8.29	11.79	11.79	1.59	1.59	1.59	11.79	8.29	1.59
87.0	7379	15671	-103	343.8	443.7	-2.8	11.79	8.56	0.98	8.56	11.91	11.91	0.98	0.98	0.98	11.91	8.56	0.98
88.0	7729	16119	-105	355.6	452.2	-1.4	12.32	8.49	0.14	8.49	12.32	12.32	0.14	0.14	0.14	12.32	8.49	0.14
89.0	8091	16576	-106	367.7	460.8	-0.9	12.90	8.34	-0.06	8.34	12.90	12.90	-0.06	-0.06	-0.06	12.90	8.34	-0.06
90.0	8465	17041	-107	380.3	469.2	-0.9	13.72	8.15	0.53	8.15	13.72	13.72	0.53	0.53	0.53	13.72	8.15	0.53
91.0	8852	17514	-108	393.6	477.4	-0.9	14.07	8.16	0.33	8.16	14.07	14.07	0.33	0.33	0.33	14.07	8.16	0.33
92.0	9252	17996	-109	407.6	485.5	-0.8	14.07	8.18	0.32	8.18	14.44	14.44	0.32	0.32	0.32	14.44	8.18	0.32
93.0	9667	18485	-109	421.8	493.8	-0.2	14.44	8.15	0.23	8.15	14.94	14.94	0.23	0.23	0.23	14.94	8.15	0.23
94.0	10096	18983	-110	436.5	501.9	-0.2	14.94	8.17	0.33	8.17	16.99	16.99	0.33	0.33	0.33	16.99	8.17	0.33
95.0	10540	19489	-110	451.6	510.0	0.2	15.50	8.06	0.28	8.06	17.24	17.24	0.28	0.28	0.28	17.24	8.06	0.28
96.0	10999	20003	-109	467.4	518.0	0.4	15.92	8.05	0.53	8.05	17.55	17.55	0.53	0.53	0.53	17.55	8.05	0.53
97.0	11475	20526	-108	487.6	485.5	-1.2	16.37	8.09	0.63	8.09	17.87	17.87	0.63	0.63	0.63	17.87	8.09	0.63
98.0	11967	21056	-107	500.0	534.3	1.6	16.56	8.20	0.37	8.20	18.21	18.21	0.37	0.37	0.37	18.21	8.20	0.37
99.0	12475	21594	-105	516.7	542.4	1.9	16.99	8.17	0.33	8.17	18.56	18.56	0.33	0.33	0.33	18.56	8.17	0.33
100.0	13003	22138	-100	533.9	550.7	2.3	17.24	8.35	0.35	8.35	18.90	18.90	0.35	0.35	0.35	18.90	8.35	0.35
101.0	13546	22693	-98	551.3	559.0	2.6	17.55	8.42	0.29	8.42	19.25	19.25	0.29	0.29	0.29	19.25	8.42	0.29
102.0	14106	23256	-95	569.0	567.5	2.9	17.87	8.48	0.25	8.48	19.61	19.61	0.25	0.25	0.25	19.61	8.48	0.25
103.0	14684	23828	-92	587.0	576.0	3.2	18.21	8.54	0.23	8.54	20.00	20.00	0.23	0.23	0.23	20.00	8.54	0.23
104.0	15280	24409	-89	605.4	584.6	3.4	18.56	8.60	0.21	8.60	20.75	20.75	0.21	0.21	0.21	20.75	8.60	0.21
105.0	15895	24998	-85	624.1	593.2	3.6	18.90	8.66	0.19	8.66	21.50	21.50	0.19	0.19	0.19	21.50	8.66	0.19
106.0	16528	25595	-81	643.2	601.9	3.7	19.25	8.72	0.16	8.72	22.25	22.25	0.16	0.16	0.16	22.25	8.72	0.16
107.0	17181	26202	-78	662.6	610.6	3.9	19.61	8.78	0.14	8.78	23.00	23.00	0.14	0.14	0.14	23.00	8.78	0.14

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
108.0	17854	26817	-74	682.4	619.4	4.0	19.97	8.82	0.11
109.0	18546	27441	-70	702.6	628.3	4.1	20.34	8.85	0.08
110.0	19259	28074	-65	723.1	637.1	4.2	20.73	8.86	0.07
111.0	19993	28716	-61	744.0	646.0	4.3	21.11	8.89	0.07
112.0	20747	29367	-57	765.3	654.9	4.3	21.50	8.91	0.09
113.0	21523	30026	-52	787.0	663.8	4.5	21.90	8.93	0.14
114.0	22321	30695	-48	809.1	672.8	4.6	22.30	8.97	0.17
115.0	23142	31372	-43	831.6	681.8	4.8	22.68	9.00	0.16
116.0	23985	32059	-38	854.5	690.8	4.9	23.06	9.04	0.11
117.0	24851	32754	-33	877.7	699.8	5.0	23.45	9.07	0.07
118.0	25741	33459	-28	901.4	708.9	5.0	23.85	9.10	0.04
119.0	26654	34172	-23	925.4	718.0	5.1	24.25	9.12	0.03
120.0	27592	34895	-18	949.9	727.1	5.2	24.66	9.14	0.05
121.0	28554	35627	-13	974.8	736.3	5.2	25.08	9.17	0.09
122.0	29542	36368	-8	1000.1	745.5	5.4	25.51	9.20	0.14
123.0	30555	37118	-2	1025.8	754.7	5.5	25.95	9.23	0.19
124.0	31594	37878	2	1052.0	764.0	5.7	26.40	9.27	0.23
125.0	32265	38647	8	1078.6	773.3	5.9	26.83	9.31	0.21
126.0	33751	39425	14	1105.6	782.6	6.1	27.25	9.34	0.15
127.0	34870	40212	20	1133.1	791.9	6.2	27.69	9.35	0.10
128.0	36017	41009	26	1161.0	801.3	6.3	28.15	9.36	0.09
129.0	37193	41815	33	1189.4	810.6	6.4	28.63	9.34	0.08
130.0	38397	42631	39	1218.3	819.9	6.5	29.12	9.32	0.08
131.0	39630	43456	46	1247.7	829.3	6.6	29.66	9.26	0.09
132.0	40892	44290	52	1277.6	838.5	6.7	30.19	9.26	0.16
133.0	42185	45133	59	1308.0	847.8	6.8	30.71	9.21	0.13
134.0	43509	45986	66	1339.0	856.9	7.0	31.23	9.15	0.15
135.0	44864	46847	73	1370.4	866.1	7.1	31.64	9.22	0.20
136.0	46250	47718	80	1402.6	875.2	7.3	32.14	9.11	0.21
137.0	47669	48598	88	1435.2	884.2	7.5	32.63	9.03	0.22
138.0	49120	49487	95	1468.3	893.2	7.7	33.12	9.05	0.22
139.0	50605	50385	103	1501.9	902.3	7.9	33.61	9.18	0.23
140.0	52124	51292	111	1535.9	911.7	8.0	34.10	9.42	0.24
141.0	53677	52208	119	1570.2	921.3	8.2	34.59	9.76	0.24
INBOARD ENGINE CUTOFF									
141.460	54403	52633	123	1586.2	925.8	8.3	34.81	9.95	0.25

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	X <sub>E</sub> M	Y <sub>E</sub> M	Z <sub>E</sub> M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
<b>OUTBOARD ENGINE CUTOFF</b>									
146.940	63387	57730	171	1687.8	931.0	9.4	17.60	0.39	0.15
147.0	63488	57785	172	1688.9	931.1	9.4	17.60	0.38	0.15
<b>S-1B/S-IVB SEPARATION</b>									
147.740	64745	58475	179	1692.3	926.0	9.6	0.78	-8.92	0.04
148.0	65193	58719	181	1692.4	923.6	9.6	0.57	-9.00	0.03
149.0	66886	59638	191	1692.5	914.4	9.8	0.01	-9.23	0.03
150.0	68578	6058	201	1692.4	905.1	9.9	-0.13	-9.32	0.03
155.0	77064	64973	251	1708.2	867.8	10.3	5.25	-6.23	0.07
160.0	85674	69238	304	1736.4	838.0	10.6	6.14	-5.79	0.08
165.0	9433	73358	357	1767.1	809.2	10.9	6.23	-5.72	0.08
170.0	103347	77335	413	1798.4	781.0	11.4	6.31	-5.66	0.08
175.0	112419	81172	471	1830.6	753.3	11.7	6.39	-5.60	0.09
<b>INTRODUCE GUIDANCE</b>									
176.110	114454	82004	484	1837.8	747.2	11.8	6.57	-5.46	0.05
180.0	121653	84869	530	1863.3	726.1	12.0	6.47	-5.36	0.04
185.0	131050	88446	592	1895.1	701.3	12.6	6.14	-4.64	0.10
190.0	140601	91887	656	1925.3	679.6	13.1	5.90	-4.10	0.12
195.0	150301	95235	722	1954.8	659.4	13.6	5.98	-4.07	0.10
200.0	160150	98480	792	1985.0	639.0	14.3	6.12	-4.03	0.15
205.0	170152	101624	864	2015.8	618.6	14.8	6.22	-4.10	0.16
210.0	180310	104666	941	2047.2	598.0	15.8	6.34	-4.15	0.26
215.0	190626	107605	1023	2079.2	577.3	17.2	6.43	-4.15	0.30
220.0	201103	110440	1113	2111.8	556.7	18.8	6.53	-4.14	0.32
225.0	211744	113172	1211	2144.8	536.2	20.3	6.64	-4.13	0.30
230.0	222552	115802	1316	2178.4	515.7	22.0	6.75	-4.10	0.29
235.0	233529	118329	1430	2212.3	495.2	23.6	6.83	-4.11	0.30
240.0	244676	120753	1552	2246.8	474.8	25.2	6.96	-4.03	0.34
245.0	255997	123077	1682	2281.7	454.4	26.8	7.05	-4.04	0.34
250.0	26494	125298	1820	2317.3	434.2	28.5	7.20	-4.03	0.34
255.0	279171	127419	1967	2353.3	414.1	30.2	7.29	-4.01	0.37
260.0	291028	129439	2123	2389.9	394.1	31.9	7.38	-4.03	0.34
265.0	302071	131360	2287	2427.1	33.7	33.4	7.46	-4.03	0.33
270.0	315200	133180	2459	2464.5	354.0	35.4	7.45	-4.07	0.34
275.0	327116	134899	2640	2502.0	333.6	37.2	7.43	-4.14	0.33

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
280.0	340318	136515	2831	2538.8	312.8	38.9	7.15	-4.20	0.38
285.0	353100	138027	3030	2573.6	292.2	40.8	6.91	-4.13	0.41
290.0	366055	139437	3239	2608.5	271.4	42.7	6.96	-4.20	0.37
295.0	379185	140741	3457	2643.4	250.2	44.6	7.06	-4.22	0.41
300.0	392489	141938	3685	2678.1	228.5	46.4	6.89	-4.41	0.34
305.0	405966	143026	3922	2712.6	206.5	48.3	6.88	-4.39	0.37
310.0	419615	144004	4168	2747.0	184.9	50.3	6.87	-4.27	0.43
315.0	433436	144876	4425	2781.8	164.2	52.3	7.06	-4.03	0.40
320.0	447434	145648	4691	2817.6	144.5	54.4	7.40	-3.79	0.46
325.0	461615	146323	4969	2854.8	125.5	56.5	7.55	-3.75	0.39
330.0	475985	146904	5256	2893.4	107.1	58.6	7.84	-3.69	0.43
335.0	490551	147393	5554	2933.4	88.5	60.6	8.12	-3.66	0.43
340.0	505321	147790	5862	2974.9	70.1	62.7	8.45	-3.67	0.40
345.0	520302	148094	6181	3017.6	51.6	64.7	8.61	-3.76	0.37
350.0	535498	148305	6509	3060.9	32.8	66.6	8.71	-3.77	0.40
355.0	550911	148422	6847	3104.4	13.8	68.7	8.75	-3.88	0.39
360.0	566542	148442	7196	3148.0	-5.6	70.7	8.80	-3.84	0.40
365.0	582392	148367	7554	3191.9	-24.8	72.7	8.83	-3.81	0.42
370.0	598463	148195	7923	3236.5	-43.8	74.8	9.04	-3.78	0.41
375.0	614759	147929	8303	3281.7	-62.8	76.9	9.09	-3.82	0.38
380.0	631282	147568	8692	3327.6	-81.6	79.1	9.25	-3.77	0.43
385.0	648036	147113	9093	3374.1	-100.5	81.2	9.38	-3.70	0.44
390.0	665024	146564	9505	3421.2	-119.2	83.5	9.48	-3.81	0.44
395.0	682248	145921	9928	3468.8	-138.0	85.7	9.60	-3.78	0.45
400.0	699712	145184	10362	3516.8	-156.9	88.0	9.71	-3.73	0.50
405.0	717418	144353	10808	3565.7	-175.6	90.3	9.87	-3.78	0.47
410.0	735371	143428	11266	3615.3	-194.4	92.7	10.03	-3.71	0.48
415.0	752272	142409	11735	3665.6	-213.0	95.1	10.22	-3.69	0.50
420.0	772028	141298	12217	3716.7	-231.6	97.5	10.34	-3.70	0.47
425.0	790742	140094	12710	3769.1	-249.9	99.9	10.59	-3.64	0.48
430.0	809721	138800	13216	3822.9	-267.8	102.4	10.88	-3.54	0.50
435.0	828973	137416	13735	3877.8	-285.5	104.9	11.19	-3.46	0.53
440.0	848502	135946	14266	3934.1	-302.6	107.4	11.35	-3.42	0.47
445.0	868315	134390	14809	3991.0	-319.6	110.0	11.38	-3.36	0.53
450.0	888413	132750	15365	4048.3	-336.4	112.5	11.58	-3.27	0.53
455.0	908798	131027	15935	4105.9	-353.1	115.1	11.59	-3.38	0.51
460.0	929472	129219	16516	4163.3	-370.2	117.7	11.47	-3.43	0.51
465.0	950433	127324	17111	4221.5	-387.6	120.3	11.80	-3.49	0.55
470.0	971687	125342	17720	4279.9	-405.8	123.1	11.77	-3.72	0.57
475.0	993235	123266	18342	4339.2	-424.8	125.8	11.98	-3.85	0.55
480.0	1015082	121093	18978	4399.9	-444.4	128.7	12.26	-4.01	0.55
485.0	1037237	118821	19629	4462.2	-464.6	131.5	12.57	-4.12	0.61
490.0	1059707	116447	20294	4526.2	-484.9	134.5	12.87	-4.07	0.62
495.0	1082501	113972	20974	4591.8	-504.9	137.5	13.35	-3.97	0.55

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S		DYE M/S		DDXE M/S SQ		DDYE M/S SQ	
				DXE M/S	H/S	DYE M/S	H/S	DDXE M/S SQ	H/S SQ	DDYE M/S SQ	H/S SQ
500.0	1105628	111399	216668	4659.3	-524.1	140.4	13.61	-3.71	0.59	-3.71	0.59
505.0	1129096	108733	22378	4727.9	-542.1	143.5	13.71	-3.52	0.63	-7.93	0.37
510.0	1152908	23103	4797.2	558.8	146.5	13.89	-3.25	0.59	0.59	-7.91	0.37
515.0	1177069	103147	23843	4867.3	-574.2	149.6	14.23	-2.92	0.62	-7.56	0.27
520.0	1201585	100241	24599	4939.9	-588.0	152.7	14.79	-2.64	0.58	-7.35	0.27
525.0	1226474	97270	25370	5016.0	-600.2	155.8	15.46	-2.32	0.62	-7.11	0.28
530.0	1251750	94242	26157	5094.6	-610.5	159.1	15.91	-1.78	0.63	-7.00	0.28
535.0	1277423	91171	26961	5175.1	-617.2	162.4	16.20	-0.88	0.72	-6.98	0.28
540.0	1303502	88077	27781	5256.3	-619.6	165.6	16.19	0.03	0.66	-6.96	0.28
545.0	1329986	84982	28617	5337.4	-617.8	168.9	16.19	0.61	0.65	-6.94	0.28
550.0	1356876	81903	29470	5418.8	-613.3	172.3	16.46	1.06	0.68	-6.92	0.28
555.0	1384177	78848	30339	5501.9	-608.7	175.7	16.97	0.82	0.71	-6.89	0.28
560.0	1411903	75810	31227	5589.1	-606.5	179.2	17.76	-0.01	0.70	-6.87	0.28
565.0	1440075	72773	32132	5680.7	-609.9	182.9	18.96	-1.22	0.80	-6.85	0.28
570.0	1468717	69704	33057	5777.4	-619.3	186.7	19.81	-2.84	0.80	-6.83	0.28
575.0	1497765	66563	34000	5878.6	-637.9	190.7	20.61	-4.24	0.82	-6.81	0.28
580.0	1527503	63325	34965	5982.7	-656.6	194.9	20.95	-3.21	0.84	-6.79	0.28
585.0	1557680	60008	35950	6089.0	-670.5	199.2	21.46	-2.45	0.89	-6.77	0.28
590.0	1588395	566631	36957	6197.7	-681.8	203.7	22.15	-2.04	0.91	-6.75	0.28
595.0	1619666	53195	37986	6310.1	-691.3	208.2	22.64	-1.77	0.92	-6.73	0.28
600.0	1651504	49717	39040	6425.6	-699.9	213.0	23.40	-1.58	0.94	-6.71	0.28
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S-1VB CUTOFF											
602.860	1669977	47709	39654	6492.9	-704.1	215.8	23.72	-1.47	0.96	-1.47	0.96
605.0	1683881	46187	40116	6495.6	-719.2	216.7	21.67	-2.21	0.37	-7.93	0.37
610.0	1716331	42492	41203	6484.5	-758.8	218.6	22.25	-7.91	0.37	-7.88	0.35
620.0	1781070	34507	43407	6461.7	-837.6	222.3	22.30	-2.39	0.37	-7.81	0.35
630.0	1845569	25746	45648	6438.2	-916.0	225.8	22.93	-2.45	0.35	-7.75	0.35
640.0	1909830	16196	47924	6414.0	-993.9	229.3	232.8	-2.52	0.35	-7.74	0.35
650.0	1973846	5870	50235	6389.2	-11071.5	236.1	236.1	-2.54	0.33	-7.66	0.33
660.0	2037610	-5229	52579	6363.7	-1148.6	239.4	239.4	-2.66	0.33	-7.66	0.33
670.0	2101115	-17098	54957	6337.6	-1225.2	242.6	242.6	-2.67	0.34	-7.59	0.27
680.0	2164355	-29731	57368	6310.8	-1301.4	245.8	245.8	-2.75	0.29	-7.56	0.27
690.0	2227324	-43126	59810	6283.4	-1377.2	248.7	248.7	-2.80	0.30	-7.58	0.28
700.0	2290017	-57278	62283	6255.5	-1452.8	251.7	251.7	-2.90	0.30	-7.50	0.28
710.0	2352429	-72186	64785	6227.0	-1528.0	254.5	254.5	-2.95	0.32	-7.43	0.27
720.0	2414553	-87844	67315	6197.7	-1602.8	257.3	257.3	-3.03	0.27	-7.38	0.27
730.0	2476385	-10424	69874	6167.7	-1676.9	260.0	260.0	-3.08	0.27	-7.35	0.27
740.0	2537915	-121378	72459	6137.1	-1750.4	262.7	262.7	-3.11	0.28	-7.32	0.28
750.0	2591913	-139242	75073	6106.1	-1823.5	265.3	265.3	-3.17	0.28	-7.23	0.28
760.0	2660031	-157837	77713	6074.3	-1896.2	267.8	267.8	-3.23	0.28	-7.21	0.27
770.0	2720606	-1771165	80379	6042.0	-1968.5	267.0	267.0	-3.23	0.27	-7.21	0.27

TABLE VI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE		DYE		DDXE		DDYE	
				M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ
780.0	2780864	-197217	83069	6009.2	-2040.3	270.2	-3.31	-7.20	0.22		
790.0	2840797	-217975	85782	5975.7	-2111.7	272.6	-3.33	-7.12	0.22		
800.0	2900382	-239438	88520	5941.7	-2182.6	274.8	-3.40	-7.08	0.20		
810.0	2959617	-261622	91280	5907.0	-2253.2	277.0	-3.46	-7.02	0.23		
820.0	3018518	-284512	94060	5871.8	-2323.3	279.1	-3.59	-7.03	0.18		
830.0	3077060	-308081	96862	5836.0	-2392.9	281.2	-3.62	-6.95	0.19		
840.0	3135229	-332364	99885	5799.7	-2462.1	283.1	-3.60	-6.86	0.20		
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S-IVB/CSM SEPARATION											
844.950	3163897	-344641	101088	5781.5	-2496.2	284.1	-3.69	-6.92	0.16		

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
<b>GUIDANCE REFERENCE RELEASE</b>									
-5.038	4199.284	-3717.522	3027.487	271.1	306.2	0.0	-0.03	0.01	0.30
0.0	4200.649	-3715.979	3027.487	271.0	306.3	0.0	-0.03	0.01	0.30
<b>FIRST MOTION</b>									
0.110	4200.679	-3715.945	3027.487	271.0	306.3	0.0	1.01	-1.30	1.36
<b>LIFTOFF SIGNAL</b>									
0.370	4200.750	-3715.865	3027.487	271.2	306.0	0.3	1.10	-1.28	1.25
1.0	4200.921	-3715.673	3027.487	272.0	305.2	0.9	1.26	-1.25	1.03
2.0	4201.194	-3715.368	3027.488	273.4	304.0	2.0	1.44	-1.24	1.03
3.0	4201.468	-3715.065	3027.491	274.9	302.7	3.0	1.54	-1.26	1.04
4.0	4201.743	-3714.763	3027.494	276.4	301.4	4.0	1.60	-1.31	1.07
5.0	4202.020	-3714.462	3027.499	278.0	300.1	5.1	1.62	-1.37	1.11
6.0	4202.299	-3714.163	3027.505	279.7	298.7	6.3	1.63	-1.43	1.15
7.0	4202.580	-3713.865	3027.512	281.3	297.3	7.4	1.64	-1.48	1.19
8.0	4202.862	-3713.568	3027.520	283.0	295.8	8.6	1.67	-1.53	1.22
9.0	4203.146	-3713.273	3027.529	284.7	294.2	9.9	1.70	-1.58	1.26
10.0	4203.431	-3712.980	3027.539	286.4	292.6	11.2	1.75	-1.61	1.29
11.0	4203.719	-3712.688	3027.551	288.2	291.0	12.5	1.81	-1.64	1.32
12.0	4204.008	-3712.398	3027.564	290.0	289.4	13.8	1.88	-1.66	1.35
13.0	4204.298	-3712.110	3027.579	291.9	287.7	15.2	1.97	-1.67	1.37
14.0	4204.591	-3711.823	3027.595	294.0	286.0	16.5	2.06	-1.69	1.40
15.0	4204.886	-3711.538	3027.612	296.1	284.3	18.0	2.16	-1.70	1.42
16.0	4205.184	-3711.254	3027.631	298.3	282.6	19.4	2.26	-1.71	1.45
17.0	4205.483	-3710.972	3027.651	300.6	280.9	20.9	2.36	-1.72	1.47
18.0	4205.785	-3710.692	3027.672	303.0	279.2	22.3	2.46	-1.74	1.50
19.0	4206.089	-3710.414	3027.695	305.5	277.5	23.9	2.56	-1.75	1.53
20.0	4206.396	-3710.137	3027.720	308.2	275.7	25.4	2.65	-1.77	1.56
21.0	4206.705	-3709.862	3027.746	310.8	273.9	27.0	2.74	-1.79	1.60
22.0	4207.018	-3709.590	3027.774	313.6	272.1	28.6	2.82	-1.80	1.63
23.0	4207.333	-3709.318	3027.803	316.5	270.3	30.2	2.91	-1.81	1.66
24.0	4207.651	-3709.049	3027.835	319.5	268.5	31.9	3.00	-1.81	1.69
25.0	4207.971	-3708.781	3027.867	322.5	266.7	33.6	3.10	-1.80	1.72
26.0	4208.296	-3708.515	3027.902	325.7	265.0	35.4	3.20	-1.78	1.75
27.0	4208.623	-3708.251	3027.938	328.9	263.2	37.1	3.32	-1.75	1.77
28.0	4208.953	-3707.989	3027.976	332.3	261.5	38.9	3.45	-1.70	1.78

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DX SP M/S	DY SP M/S	DZ SP M/S	DDX SP M/S SQ	DDY SP M/S SQ	DDZ SP M/S SQ
							DZSP M/S	DYSP M/S	DXSP M/S
29.0	4209.287	-3707.728	3028.016	335.8	259.8	40.7	3.60	-1.64	1.79
30.0	4209.625	-3707.469	3028.057	258.2	42.5	3.76	-1.57	1.80	
31.0	4209.967	-3707.212	3028.101	343.4	256.7	44.3	3.94	-1.49	1.79
32.0	4210.312	-3706.956	3028.146	347.4	255.2	46.1	4.13	-1.41	1.78
33.0	4210.661	-3706.701	3028.193	351.6	253.9	47.8	4.32	-1.33	1.78
34.0	4211.015	-3706.448	3028.242	356.1	252.6	49.6	4.49	-1.28	1.77
35.0	4211.374	-3706.196	3028.292	360.6	251.3	51.5	4.46	-1.40	1.78
36.0	4211.737	-3705.945	3028.344	365.1	249.8	53.2	4.67	-1.43	1.76
37.0	4212.104	-3705.696	3028.398	369.9	248.5	55.0	4.82	-1.29	1.73
38.0	4212.477	-3705.448	3028.454	374.8	247.2	56.7	4.97	-1.25	1.77
39.0	4212.854	-3705.202	3028.512	379.9	246.1	58.6	5.22	-1.03	1.91
40.0	4213.237	-3704.956	3028.571	385.2	245.1	60.4	5.30	-0.99	1.84
41.0	4213.624	-3704.712	3028.633	390.5	244.2	62.3	5.42	-1.05	1.89
42.0	4214.018	-3704.468	3028.696	396.0	243.0	64.2	5.57	-1.02	1.89
43.0	4214.417	-3704.225	3028.761	401.7	242.2	66.1	5.72	-0.94	1.81
44.0	4214.821	-3703.984	3028.828	407.5	241.2	67.8	5.93	-0.86	1.79
45.0	4215.232	-3703.743	3028.897	413.6	240.5	69.7	6.06	-0.82	1.88
46.0	4215.648	-3703.503	3028.968	419.7	239.6	71.6	6.24	-0.65	1.86
47.0	4216.071	-3703.264	3029.040	426.0	239.1	73.4	6.43	-0.68	1.80
48.0	4216.500	-3703.025	3029.115	432.5	238.3	75.2	6.58	-0.57	1.80
49.0	4216.936	-3702.787	3029.191	439.2	237.8	77.0	6.69	-0.66	1.72
50.0	4217.379	-3702.550	3029.269	445.9	237.1	78.7	6.84	-0.53	1.72
51.0	4217.828	-3702.313	3029.348	452.8	236.5	80.4	6.96	-0.71	1.73
52.0	4218.284	-3702.076	3029.429	459.9	235.8	82.2	7.07	-0.59	1.88
53.0	4218.748	-3701.841	3029.513	467.0	235.4	84.1	7.21	-0.43	1.93
54.0	4219.218	-3701.606	3029.598	474.3	235.0	86.1	7.42	-0.35	1.90
55.0	4219.696	-3701.371	3029.685	481.9	234.8	87.9	7.70	-0.10	1.79
56.0	4220.182	-3701.136	3029.774	489.5	234.6	89.7	7.81	-0.05	1.83
57.0	4220.676	-3700.902	3029.864	497.4	234.5	91.6	7.93	-0.01	1.91
58.0	4221.177	-3700.667	3029.956	505.3	234.5	93.6	8.13	0.08	1.97
59.0	4221.686	-3700.433	3030.051	513.5	234.5	95.6	8.29	0.14	1.98
60.0	4222.204	-3700.198	3030.147	521.8	234.7	97.7	8.43	0.22	2.01
61.0	4222.730	-3699.964	3030.246	530.3	234.9	99.7	8.55	0.30	1.93
62.0	4223.265	-3699.728	3030.346	538.9	235.2	101.5	8.70	0.35	1.76
63.0	4223.808	-3699.493	3030.449	547.6	235.5	103.2	8.81	0.35	1.62
64.0	4224.360	-3699.257	3030.552	556.5	235.9	104.8	8.85	0.42	1.59
65.0	4224.921	-3699.021	3030.658	565.3	236.4	106.4	8.88	0.58	1.58
MACH @NE									
65.500	4225.205	-3698.903	3030.711	569.8	236.7	107.2	8.91	0.65	1.56
66.0	4225.491	-3698.785	3030.765	574.2	237.0	108.0	8.94	0.73	1.55
67.0	4226.070	-3698.547	3030.874	583.2	237.9	109.6	9.02	0.86	1.48

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DX SP M/S		DY SP M/S		DZ SP M/S		DDX SP M/S SQ		DDY SP M/S SQ		DDZ SP M/S SQ	
				DYNAMIC PRESSURE	MAXIMUM DYNAMIC PRESSURE										
68.0	42226.657	-3698.309	3030.984	592.3	238.8	111.0	9.14	0.94	1.38.	1.38.	1.38.	1.38.	1.38.	1.38.	1.38.
69.0	42227.254	-3698.079	3031.095	601.5	239.8	112.4	9.31	0.97	1.38.	1.38.	1.38.	1.38.	1.38.	1.38.	1.38.
70.0	42227.860	-3697.829	3031.208	610.9	240.8	113.8	9.51	0.98	1.48	1.48	1.48	1.48	1.48	1.48	1.48
71.0	42228.476	-3697.588	3031.323	620.6	241.9	115.3	9.75	1.03	1.53	1.53	1.53	1.53	1.53	1.53	1.53
72.0	42229.101	-3697.345	3031.439	630.5	243.0	116.9	10.08	1.11	1.47	1.47	1.47	1.47	1.47	1.47	1.47
73.0	42229.737	-3697.102	3031.556	640.8	244.3	118.3	10.36	1.21	1.38	1.38	1.38	1.38	1.38	1.38	1.38
74.0	4230.383	-3696.857	3031.675	651.3	245.6	119.7	10.57	1.34	1.31	1.31	1.31	1.31	1.31	1.31	1.31
75.0	4231.040	-3696.611	3031.795	662.1	247.1	120.9	10.82	1.57	1.34	1.34	1.34	1.34	1.34	1.34	1.34
76.000	4231.707	-3696.363	3031.917	673.1	248.9	122.3	11.10	1.89	1.53	1.53	1.53	1.53	1.53	1.53	1.53
77.0	4232.386	-3696.113	3032.040	684.4	251.1	124.0	11.34	2.22	1.80	1.80	1.80	1.80	1.80	1.80	1.80
78.0	4233.076	-3695.860	3032.164	695.9	253.6	125.9	11.56	2.40	1.98	1.98	1.98	1.98	1.98	1.98	1.98
79.0	4233.778	-3695.605	3032.291	707.7	256.2	128.0	11.80	2.44	2.03	2.03	2.03	2.03	2.03	2.03	2.03
80.0	4234.492	-3695.348	3032.420	719.7	258.8	130.1	12.05	2.46	2.02	2.02	2.02	2.02	2.02	2.02	2.02
81.0	4235.218	-3695.088	3032.551	731.9	261.3	132.0	12.37	2.66	2.05	2.05	2.05	2.05	2.05	2.05	2.05
82.0	4235.956	-3694.825	3032.684	744.5	264.1	134.1	12.79	2.88	1.86	1.86	1.86	1.86	1.86	1.86	1.86
83.0	4236.707	-3694.560	3032.819	757.5	266.9	135.5	13.15	2.54	1.10	1.10	1.10	1.10	1.10	1.10	1.10
84.0	4237.471	-3694.292	3032.955	769.9	269.3	136.3	13.49	2.54	0.62	0.62	0.62	0.62	0.62	0.62	0.62
85.0	4238.249	-3694.021	3033.092	784.5	271.9	136.7	13.89	2.27	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
86.0	4239.040	-3693.748	3033.228	798.7	274.0	136.4	14.28	2.27	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44
87.0	4239.846	-3693.473	3033.365	813.0	276.3	136.0	14.34	2.12	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
88.0	4240.666	-3693.196	3033.501	827.4	278.4	136.3	14.50	2.36	0.55	0.55	0.55	0.55	0.55	0.55	0.55
89.0	4241.501	-3692.916	3033.637	841.9	281.1	137.2	14.60	3.08	1.13	1.13	1.13	1.13	1.13	1.13	1.13
90.0	4242.350	-3692.633	3033.775	856.7	284.5	138.3	14.88	3.65	1.10	1.10	1.10	1.10	1.10	1.10	1.10
91.0	4243.215	-3692.347	3033.914	871.8	288.4	139.2	15.37	4.23	0.72	0.72	0.72	0.72	0.72	0.72	0.72
92.0	4244.094	-3692.056	3034.053	887.4	292.9	139.8	15.68	4.32	0.41	0.41	0.41	0.41	0.41	0.41	0.41
93.0	4244.990	-3691.761	3034.194	903.2	297.1	140.1	15.96	4.56	0.35	0.35	0.35	0.35	0.35	0.35	0.35
94.0	4245.801	-3691.462	3034.334	919.3	302.0	140.5	16.29	4.95	0.30	0.30	0.30	0.30	0.30	0.30	0.30
95.0	4246.828	-3691.158	3034.475	935.7	307.1	140.7	16.64	5.34	0.08	0.08	0.08	0.08	0.08	0.08	0.08
96.0	4247.773	-3690.848	3034.615	952.5	312.6	140.7	16.99	5.50	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22
97.0	4248.734	-3690.532	3034.756	969.7	318.1	140.2	17.36	5.72	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39
98.0	4249.712	-3690.211	3034.896	987.2	324.0	140.1	17.52	5.91	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16
99.0	4250.708	-3689.884	3035.036	1004.8	330.0	139.9	17.81	6.23	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24
100.0	4251.723	-3689.549	3035.171	1022.8	336.3	139.6	18.11	6.29	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
101.0	4252.755	-3689.210	3035.310	1041.0	342.7	139.4	18.37	6.47	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22
102.0	4253.805	-3688.864	3035.450	1059.5	349.3	139.1	18.64	6.67	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
103.0	4254.874	-3688.511	3035.589	1078.3	356.1	138.9	18.92	6.87	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26
104.0	4255.962	-3688.552	3035.728	1097.4	363.1	138.6	19.21	7.07	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
105.0	4257.069	-3687.785	3035.866	1116.7	370.2	138.3	19.49	7.28	-0.32	-0.32	-0.32	-0.32	-0.32	-0.32	-0.32
106.0	4228.196	-3687.411	3036.004	1136.3	377.6	138.0	19.78	7.49	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35
107.0	4229.342	-3687.020	3036.142	1156.3	385.2	137.6	20.07	7.70	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DX SP M/S		DY SP M/S		DZ SP M/S		DDX SP M/S		DDY SP M/S		DDZ SP M/S	
				M	S	M	S	M	S	M	S	M	S	M	S
108.0	4260.508	-3686.641	3036.280	1176.5	.392.1	137.2	.20.35	7.93	-0.42						
109.0	4261.695	-3686.244	3036.417	1197.0	.401.1	136.7	.20.64	8.17	-0.47						
110.0	4262.903	-3685.839	3036.553	1217.8	.409.4	136.2	.20.92	8.42	-0.54						
111.0	4264.131	-3685.426	3036.689	1238.8	.418.0	135.6	.21.21	8.66	-0.62						
112.0	4265.381	-3685.003	3036.825	1260.2	.426.7	135.0	.21.51	8.90	-0.71						
113.0	4266.652	-3684.572	3036.959	1281.9	.435.8	134.2	.21.83	9.13	-0.83						
114.0	4267.945	-3684.132	3037.093	1303.9	.445.0	133.3	.22.15	9.35	-0.94						
115.0	4269.260	-3683.682	3037.226	1326.2	.454.5	132.4	.22.44	9.59	-0.99						
116.0	4270.598	-3683.223	3037.358	1348.8	.464.2	131.4	.22.73	9.84	-1.03						
117.0	4271.958	-3682.754	3037.490	1371.6	.474.2	130.3	.23.03	10.10	-1.06						
118.0	4273.341	-3682.275	3037.619	1394.8	.484.4	129.2	.23.32	10.36	-1.11						
119.0	4274.748	-3681.785	3037.748	1418.3	.494.9	128.1	.23.63	10.62	-1.19						
120.0	4276.178	-3681.285	3037.875	1442.1	.504.7	126.8	.23.94	10.87	-1.29						
121.0	4277.633	-3680.774	3038.002	1466.2	.516.6	125.5	.24.27	11.11	-1.40						
122.0	4279.111	-3680.252	3038.126	1490.7	.527.9	124.0	.24.61	11.35	-1.52						
123.0	4280.615	-3679.718	3038.250	1515.4	.539.4	122.4	.24.96	11.60	-1.66						
124.0	4282.143	-3679.173	3038.371	1540.6	.551.1	120.7	.25.31	11.86	-1.77						
125.0	4283.696	-3678.616	3038.491	1566.0	.561.1	119.0	.25.64	12.13	-1.83						
126.0	4285.275	-3678.047	3038.609	1591.8	.575.4	117.1	.25.96	12.42	-1.86						
127.0	4286.880	-3677.465	3038.726	1618.0	.587.9	115.2	.26.28	12.72	-1.92						
128.0	4288.512	-3676.871	3038.840	1644.4	.600.8	113.2	.26.61	13.04	-2.01						
129.0	4290.170	-3676.264	3038.952	1671.2	.614.1	111.2	.26.94	13.37	-2.12						
130.0	4291.855	-3675.643	3039.062	1698.3	.627.6	109.0	.27.28	13.71	-2.24						
131.0	4293.567	-3675.008	3039.170	1725.8	.641.5	106.7	.27.63	14.09	-2.40						
132.0	4295.307	-3674.360	3039.276	1753.6	.655.7	104.2	.28.03	14.49	-2.58						
133.0	4297.075	-3673.697	3039.379	1781.8	.670.3	101.6	.28.36	14.79	-2.70						
134.0	4298.871	-3673.019	3039.479	1810.3	.685.3	98.8	.28.70	15.15	-2.85						
135.0	4300.696	-3672.326	3039.577	1839.2	.700.6	95.9	.29.05	15.36	-2.96						
136.0	4302.550	-3671.618	3039.671	1868.6	.716.3	92.7	.29.34	15.75	-3.14						
137.0	4304.433	-3670.894	3039.762	1898.1	.732.5	89.5	.29.64	16.12	-3.30						
138.0	4306.346	-3670.153	3039.850	1928.1	.749.0	86.1	.30.01	16.43	-3.40						
139.0	4308.289	-3669.396	3039.935	1958.5	.765.7	82.7	.30.45	16.68	-3.45						
140.0	4310.263	-3668.622	3040.016	1989.3	.782.6	79.2	.30.96	16.86	-3.46						
141.0	4312.268	-3667.831	3040.093	2020.6	.799.5	75.9	.31.54	16.99	-3.41						
<b>INBOARD ENGINE CUTOFF</b>															
141.460	4313.201	-3667.462	3040.128	2035.2	.807.4	74.3	.31.82	17.02	-3.38						

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S		DYSP M/S		DZSP M/S		DDXSP M/S SQ		DDYSP M/S SQ		DDZSP M/S SQ	
				M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ
<b>OUTBOARD ENGINE CUTOFF</b>															
146.940	4324.580	-3662.858	3040.477	2112.0		871.3		52.7		12.95		11.41		-3.94	
147.0	4324.706	-3662.806	3040.480	2112.8		872.0		52.5		12.94		11.42		-3.95	
<b>S-1B/S-IVB SEPARATION</b>															
147.740	4326.276	-3662.156	3040.518	2111.9		877.3		49.2		-5.46		5.90		-4.47	
148.0	4326.832	-3661.925	3040.530	2110.3		878.8		48.0		-5.67		5.81		-4.45	
149.0	4328.940	-3661.043	3040.576	2104.2		884.3		43.5		-6.23		5.58		-4.44	
150.0	4331.041	-3660.156	3040.617	2097.9		889.8		38.9		-6.39		5.54		-4.45	
155.0	4341.480	-3655.631	3040.757	2084.1		922.7		17.2		-0.44		7.24		-4.23	
160.0	4351.900	-3650.927	3040.792	2084.2		959.5		-3.8		0.50		7.56		-4.22	
165.0	4362.328	-3646.036	3040.721	2086.8		997.3		-24.7		0.60		7.58		-4.21	
170.0	4372.772	-3640.955	3040.546	2090.1		1035.0		-45.7		0.69		7.60		-4.20	
175.0	4383.234	-3635.686	3040.267	2094.5		1073.1		-66.5		0.78		7.61		-4.20	
<b>INTRODUCE GUIDANCE</b>															
176.110	4385.559	-3634.490	3040.190	2095.5		1081.6		-71.2		1.00		7.67		-4.15	
180.0	4393.718	-3630.225	3039.881	2099.4		1111.3		-87.2		0.98		7.55		-4.07	
185.0	4404.229	-3622.576	3039.395	2105.3		1147.4		-106.8		1.22		6.89		-3.70	
190.0	4414.772	-3618.755	3038.817	2112.1		1180.7		-124.4		1.41		6.42		-3.40	
195.0	4425.350	-3612.772	3038.153	2119.3		1212.7		-141.2		1.48		6.46		-3.39	
200.0	4435.965	-3606.627	3037.404	2126.9		1245.2		-158.4		1.60		6.51		-3.44	
205.0	4446.620	-3600.319	3036.569	2134.9		1278.2		-175.6		1.63		6.61		-3.62	
210.0	4457.315	-3593.845	3035.647	2143.2		1311.4		-193.4		1.72		6.65		-3.70	
215.0	4468.053	-3587.205	3034.634	2151.9		1344.9		-211.7		1.76		6.71		-3.73	
220.0	4478.835	-3580.396	3033.529	2161.1		1378.7		-230.3		1.83		6.76		-3.74	
225.0	4489.664	-3573.418	3032.331	2170.7		1412.7		-249.0		1.90		6.84		-3.74	
230.0	4500.542	-3566.269	3031.039	2180.5		1447.0		-267.8		1.99		6.91		-3.74	
235.0	4511.470	-3558.947	3029.653	2190.7		1481.6		-286.7		2.04		6.96		-3.77	
240.0	4522.450	-3551.452	3028.172	2201.3		1516.5		-305.6		2.19		6.98		-3.79	
245.0	4533.483	-3543.782	3026.597	2212.1		1551.7		-324.7		2.25		7.05		-3.82	
250.0	4544.572	-3535.935	3024.925	2223.5		1587.1		-343.8		2.35		7.14		-3.85	
255.0	4555.719	-3527.910	3023.158	2235.3		1622.9		-363.1		2.42		7.18		-3.88	
260.0	4566.926	-3519.705	3021.295	2247.6		1659.0		-382.4		2.46		7.27		-3.89	
265.0	4578.195	-3511.320	3019.334	2260.1		1695.4		-401.9		2.51		7.33		-3.90	
270.0	4589.528	-3502.751	3017.276	2272.8		1732.1		-421.4		2.47		7.34		-3.92	
275.0	4600.923	-3493.998	3015.119	2285.3		1769.0		-441.2		2.40		7.38		-3.95	

TABLE VII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DX SP M/S	DY SP M/S	DZ SP M/S	DDX SP M/S	DDY SP M/S	DDZ SP M/S
280.0	4612.379	-3485.061	3012.864	2297.0	1805.7	-461.0	2.16	7.21	-3.95
285.0	4623.891	-3475.944	3010.510	2307.4	1840.9	-480.4	2.03	6.99	-3.89
290.0	4635.454	-3466.652	3008.060	2317.7	1876.2	-499.8	2.00	7.09	-3.90
295.0	4647.067	-3457.181	3005.511	2327.6	1911.9	-519.5	2.06	7.15	-3.97
300.0	4658.729	-3447.532	3002.864	2337.0	1947.8	-539.3	1.80	7.18	-3.96
305.0	4670.437	-3437.703	3000.118	2346.1	1983.6	-559.3	1.80	7.15	-3.98
310.0	4682.191	-3427.697	2997.272	2355.3	2019.1	-579.1	1.87	7.05	-3.96
315.0	4693.992	-3417.513	2994.327	2365.5	2054.4	-598.6	2.16	7.06	-3.87
320.0	4705.847	-3407.153	2991.286	2376.9	2089.7	-617.9	2.57	7.12	-3.88
325.0	4717.764	-3396.614	2988.149	2389.8	2125.6	-637.2	2.68	7.23	-3.84
330.0	4729.748	-3385.895	2984.914	2404.0	2162.1	-656.6	2.93	7.37	-3.91
335.0	4741.806	-3374.992	2981.582	2419.1	2199.6	-676.3	3.14	7.54	-3.96
340.0	4753.942	-3363.998	2978.151	2435.4	2238.1	-696.2	3.36	7.79	-4.02
345.0	4766.161	-3352.609	2974.620	2452.4	2277.4	-716.5	3.40	7.96	-4.06
350.0	4778.466	-3341.122	2970.986	2469.6	2317.4	-737.0	3.47	8.02	-4.12
355.0	4790.857	-3329.435	2967.249	2486.8	2357.6	-757.0	3.41	8.11	-4.17
360.0	4803.333	-3317.547	2963.409	2503.7	2398.0	-778.5	3.46	8.12	-4.18
365.0	4815.895	-3305.555	2959.464	2520.9	2438.6	-799.4	3.50	8.12	-4.19
370.0	4828.544	-3293.160	2955.415	2538.7	2479.5	-820.4	3.66	8.26	-4.21
375.0	4841.284	-3280.659	2951.260	2556.9	2520.8	-841.6	3.65	8.33	-4.21
380.0	4854.115	-3267.951	2946.999	2575.7	2562.5	-862.8	3.80	8.39	-4.27
385.0	4867.041	-3255.033	2942.632	2594.9	2604.7	-884.2	3.93	8.43	-4.27
390.0	4880.065	-3241.904	2938.157	2614.6	2647.1	-905.8	3.92	8.57	-4.35
395.0	4893.187	-3228.561	2933.574	2634.5	2689.9	-927.5	4.02	8.63	-4.37
400.0	4906.410	-3215.004	2928.882	2654.6	2733.6	-949.4	4.14	8.65	-4.41
405.0	4919.735	-3201.229	2924.080	2675.4	2776.8	-971.4	4.20	8.80	-4.45
410.0	4933.164	-3187.235	2919.167	2696.6	2820.9	-993.6	4.35	8.87	-4.46
415.0	4946.701	-3173.020	2914.143	2718.4	2865.5	-1016.0	4.49	8.98	-4.51
420.0	4960.349	-3158.580	2909.007	2740.7	2910.5	-1038.5	4.56	9.09	-4.52
425.0	4974.111	-3143.914	2903.758	2764.2	2956.3	-1061.3	4.77	9.22	-4.55
430.0	4987.993	-3129.016	2898.394	2788.8	3002.8	-1084.1	5.03	9.36	-4.59
435.0	5002.000	-3113.885	2892.916	2814.4	3049.9	-1107.2	5.31	9.51	-4.64
440.0	5016.139	-3098.516	2887.322	2841.1	3097.7	-1130.3	5.43	9.63	-4.61
445.0	5030.413	-3082.907	2881.613	2868.5	3145.7	-1153.5	5.49	9.59	-4.64
450.0	5044.824	-3061.058	2875.787	2896.2	3194.0	-1176.7	5.68	9.68	-4.64
455.0	5059.375	-3050.967	2869.845	2924.1	3242.5	-1200.0	5.60	9.76	-4.68
460.0	5074.065	-3034.632	2863.787	2951.6	3291.1	-1223.4	5.47	9.72	-4.68
465.0	5088.892	-3018.554	2857.610	2979.3	3340.3	-124.2	5.66	9.95	-4.82
470.0	5103.858	-3001.228	2851.314	3006.7	3390.2	-1271.5	5.48	10.06	-4.94
475.0	5118.960	-2984.150	2844.895	3034.2	3441.1	-1296.4	5.52	10.29	-5.03
480.0	5134.201	-2966.815	2838.349	3062.1	3493.3	-1322.0	5.60	10.57	-5.17
485.0	5149.583	-2949.215	2831.674	3090.7	3546.8	-1348.2	5.75	10.82	-5.34
490.0	5165.110	-2931.344	2824.866	3120.4	3601.6	-1375.0	5.99	10.99	-5.39
495.0	5180.788	-2913.197	2817.924	3151.4	3657.4	-1402.0	6.37	11.30	-5.40

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ		DDYSP M/S SQ		DDZSP M/S SQ	
							M/S	SQ	M/S	SQ	M/S	SQ
500.0	5196.627	-2894.769	2810.846	3184.3	3713.9	-1429.0	6.73		11.31		-5.36	
505.0	5212.633	-2876.059	2803.634	3218.6	3770.5	-1455.8	6.92		11.26		-5.33	
510.0	5228.815	-2857.065	2796.289	3254.4	3826.9	-1482.1	7.21		11.26		-5.22	
515.0	5245.179	-2837.790	2788.814	3291.4	3883.1	-1508.0	7.67		11.30		-5.16	
520.0	5261.735	-2818.233	2781.210	3331.4	3940.2	-1533.7	8.24		11.54		-5.12	
525.0	5278.499	-2798.386	2773.477	3374.7	3998.7	-1559.5	8.92		11.80		-5.15	
530.0	5295.487	-2778.244	2765.615	3421.2	4057.9	-1585.1	9.60		11.81		-5.01	
535.0	5312.717	-2757.808	2757.628	3471.3	4116.3	-1609.4	10.42		11.48		-4.72	
540.0	5330.206	-2737.084	2749.525	3524.8	4172.9	-1631.7	11.00		11.00		-4.23	
545.0	5347.969	-2716.083	2741.314	3581.1	4227.1	-1652.1	11.39		10.70		-3.94	
550.0	5366.019	-2694.814	2733.005	3639.4	4280.1	-1671.3	11.88		10.63		-3.82	
555.0	5384.363	-2673.279	2724.600	3698.9	4334.2	-1691.0	12.07		11.10		-4.07	
560.0	5403.008	-2651.464	2716.091	3759.5	4392.4	-1712.7	12.05		12.10		-4.64	
565.0	5421.956	-2629.346	2707.466	3820.1	4456.1	-1737.9	12.05		13.55		-5.58	
570.0	5441.203	-2606.890	2698.703	3878.9	4527.6	-1768.0	11.56		11.56		-6.54	
575.0	5460.737	-2584.057	2680.776	3935.2	4606.7	-1803.3	11.15		16.35		-7.40	
580.0	5480.555	-2560.822	2680.669	3993.4	4687.8	-1839.4	12.08		16.01		-7.01	
585.0	5500.678	-2537.186	2671.387	4056.3	4767.7	-1873.9	12.95		15.93		-6.81	
590.0	5521.127	-2513.150	2661.934	4122.6	4847.7	-1907.8	13.71		16.16		-6.79	
595.0	5541.914	-2488.705	2652.309	4192.8	4929.3	-1941.8	14.36		16.49		-6.82	
600.0	5563.059	-2463.852	2642.514	4265.7	5012.4	-1976.2	14.87		16.77		-6.87	
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S-IVB CUT OFF												
602.860	5575.320	-2449.448	2636.834	4308.7	5060.5	-1995.9	15.16		16.92		+6.91	
605.0	5584.536	-2438.603	2632.553	4299.0	5071.5	-2004.5	-7.61		3.32		-3.50	
610.0	5605.936	-243.204	2622.086	4260.9	5088.0	-2022.4	-7.63		3.28		-3.58	
620.0	5648.171	-2362.158	2602.084	4184.6	5120.5	-2058.1	-7.65		3.28		-3.54	
630.0	5689.634	-2310.796	2581.328	4108.0	5151.9	-2093.1	-7.67		3.10		-3.50	
640.0	5730.330	-2259.124	2560.223	4031.1	5182.7	-2127.8	-7.68		3.02		-3.44	
650.0	5770.256	-2207.147	2538.773	3954.0	5212.6	-2162.1	-7.73		2.95		-3.42	
660.0	5809.409	-2158.876	2516.983	3876.7	5241.8	-2196.0	-7.70		2.88		-3.36	
670.0	5847.787	-2102.318	2494.856	3799.1	5270.1	-2229.4	-7.79		2.78		-3.34	
680.0	5885.388	-2049.480	2472.396	3721.3	5297.6	-2262.5	-7.75		2.72		-3.30	
690.0	5922.210	-1996.372	2449.608	3643.4	5324.3	-2295.1	-7.80		2.66		-3.24	
700.0	5958.250	-1942.997	2426.495	3565.1	5350.6	-2327.3	-7.86		2.61		-3.23	
710.0	5993.504	-1889.363	2403.060	3486.5	5376.0	-2359.2	-7.89		2.48		-3.15	
720.0	6027.973	-1835.476	2379.309	3407.7	5400.6	-2390.7	-7.86		2.38		-3.15	
730.0	6061.658	-1781.348	2355.245	3328.8	5424.1	-2421.6	-7.90		2.31		-3.07	
740.0	6094.556	-1726.991	2330.877	3249.9	5446.8	-2452.1	-7.92		2.25		-3.04	
750.0	6126.665	-1672.413	2306.208	3170.7	5468.9	-2482.2	-7.92		2.19		-3.02	
760.0	6157.975	-1617.623	2281.240	3091.4	5490.1	-2511.9	-7.91		2.09		-2.95	
770.0	6188.484	-1562.622	2255.972	3011.9	5510.6	-2541.2	-7.94		2.02		-2.94	

TABLE VII  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DX SP M/S	DY SP M/S	DZ SP M/S	DDX SP M/S SQ	DDY SP M/S SQ	DDZ SP M/S SQ
780.0	6218.200	-1507.411	2230.411	2932.3	5530.3	-2570.1	-8.00	1.96	-2.87
790.0	6247.131	-1452.007	2204.568	2852.5	5549.3	-2598.6	-7.96	1.89	-2.83
800.0	6275.262	-1396.429	2178.446	2772.5	5567.5	-2626.6	-7.99	1.82	-2.78
810.0	6302.577	-1340.671	2152.040	2692.4	5584.9	-2654.3	-7.98	1.71	-2.76
820.0	6329.099	-1284.729	2125.357	2612.1	5601.6	-2681.5	-8.10	1.64	-2.69
830.0	6354.828	-1228.637	2098.412	2531.7	5617.5	-2708.4	-8.06	1.55	-2.66
840.0	6379.731	-1172.389	2071.193	2451.2	5632.7	-2734.8	-7.99	1.49	-2.63
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S-IVB/CSM SEPARATION									
844.950	6391.766	-1144.484	2057.621	2411.3	5639.9	-2747.8	-8.10	1.47	-2.60

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
GUIDANCE REFERENCE RELEASE											
-5.038	6373.353	-80.5611	28.3608	0.00	90.00	0.0	90.00	-0.00	409.0	0	32
0.0	6373.353	-80.5611	28.3608	0.00	90.00	0.0	90.00	-0.00	409.0	0	32
FIRST MOTION											
0.110	6373.353	-80.5611	28.3608	0.00	90.00	0.0	90.00	0.00	409.0	0	32
LIFTOFF SIGNAL											
0.370	6373.353	-80.5611	28.3608	297.36	81.47	0.5	90.00	0.07	408.9	0	32
1.0	6373.354	-80.5611	28.3608	298.03	84.01	1.8	89.99	0.25	408.8	0	33
2.0	6373.357	-80.5611	28.3608	299.33	86.88	3.9	89.99	0.55	408.8	0	36
3.0	6373.362	-80.5611	28.3608	300.96	88.66	6.2	89.99	0.86	408.8	0	41
4.0	6373.369	-80.5611	28.3608	302.04	89.69	8.5	90.00	1.19	409.0	0	48
5.0	6373.379	-80.5611	28.3608	131.35	89.79	10.9	90.00	1.52	409.1	0	58
6.0	6373.391	-80.5611	28.3608	136.07	89.60	13.3	90.01	1.86	409.3	0	70
7.0	6373.405	-80.5611	28.3608	146.42	89.59	15.8	90.01	2.21	409.3	0	84
8.0	6373.422	-80.5611	28.3608	163.89	89.64	18.4	90.02	2.57	409.4	0	101
9.0	6373.442	-80.5611	28.3608	187.78	89.67	21.0	90.02	2.94	409.5	0	121
10.0	6373.465	-80.5611	28.3608	208.64	89.66	23.7	90.02	3.32	409.6	1	144
11.0	6373.490	-80.5611	28.3608	219.22	89.64	26.5	90.02	3.70	409.7	1	169
12.0	6373.517	-80.5611	28.3608	219.31	89.64	29.3	90.02	4.10	409.7	1	196
13.0	6373.548	-80.5611	28.3608	207.87	89.66	32.2	90.02	4.51	410.2	1	227
14.0	6373.582	-80.5612	28.3608	183.27	89.66	35.2	90.03	4.92	410.5	2	261
15.0	6373.619	-80.5612	28.3608	155.72	89.57	38.3	90.04	5.35	410.9	2	298
16.0	6373.659	-80.5611	28.3608	137.84	89.37	41.5	90.05	5.78	411.4	2	337
17.0	6373.702	-80.5611	28.3608	128.02	89.11	44.7	90.06	6.23	412.0	3	380
18.0	6373.748	-80.5611	28.3608	122.38	88.80	48.0	90.08	6.68	412.6	3	427
19.0	6373.798	-80.5611	28.3608	118.84	88.48	51.5	90.09	7.15	413.4	4	477
20.0	6373.851	-80.5611	28.3608	116.41	88.14	55.0	90.11	7.62	414.3	5	530
21.0	6373.908	-80.5611	28.3608	114.61	87.80	58.6	90.13	8.11	415.2	7	586
22.0	6373.968	-80.5611	28.3608	113.17	87.46	62.3	90.15	8.60	416.2	10	647
23.0	6374.032	-80.5610	28.3607	111.94	87.12	66.0	90.17	9.09	417.3	13	711
24.0	6374.100	-80.5610	28.3607	110.84	86.78	69.9	90.19	9.60	418.5	16	779
25.0	6374.172	-80.5610	28.3607	109.84	86.42	73.8	90.22	10.11	419.9	20	850
26.0	6374.247	-80.5609	28.3607	108.90	86.06	77.8	90.24	10.62	421.3	25	926
27.0	6374.327	-80.5609	28.3607	108.02	85.66	81.9	90.26	11.14	422.9	31	1006
28.0	6374.411	-80.5608	28.3607	107.20	85.23	86.1	90.29	11.66	424.6	38	1190

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
29.0	6374.499	-80.5607	28.3606	106.47	84.77	90.4	90.32	12.18	426.6	1177
30.0	6374.591	-80.5606	28.3606	105.83	84.25	94.7	90.35	12.70	428.7	54
31.0	6374.687	-80.5605	28.3606	105.30	83.68	99.1	90.39	13.21	631.0	1366
32.0	6374.788	-80.5604	28.3606	104.87	83.07	103.7	90.44	13.73	433.6	76
33.0	6374.893	-80.5603	28.3605	104.55	82.41	108.3	90.49	14.24	436.4	89
34.0	6375.002	-80.5601	28.3605	104.33	81.72	113.1	90.54	14.76	439.4	104
35.0	6375.117	-80.5600	28.3604	104.04	81.08	118.0	90.60	15.28	442.5	123
36.0	6375.236	-80.5598	28.3604	104.30	80.50	122.9	90.67	15.79	445.6	142
37.0	6375.359	-80.5596	28.3603	104.27	79.87	128.1	90.74	16.30	449.0	163
38.0	6375.488	-80.5593	28.3603	104.59	79.26	133.2	90.83	16.81	452.5	187
39.0	6375.621	-80.5591	28.3602	104.23	78.58	138.5	90.89	17.31	213	2300
40.0	6375.759	-80.5588	28.3602	104.08	77.91	144.0	90.96	17.81	460.5	242
41.0	6375.903	-80.5585	28.3601	103.81	77.22	149.5	91.02	18.28	464.8	274
42.0	6376.051	-80.5581	28.3600	103.83	76.64	155.3	91.11	18.79	469.1	308
43.0	6376.205	-80.5578	28.3599	103.63	75.95	161.0	91.18	19.25	473.7	346
44.0	6376.364	-80.5574	28.3598	103.81	75.35	166.9	91.28	19.73	478.3	386
45.0	6376.528	-80.5569	28.3597	103.71	74.67	173.0	91.37	20.19	483.4	430
46.0	6376.697	-80.5564	28.3596	103.71	74.07	179.2	91.46	20.65	488.5	478
47.0	6376.872	-80.5559	28.3595	103.63	73.38	185.5	91.55	21.09	496.0	529
48.0	6377.053	-80.5554	28.3594	103.71	72.76	191.9	91.66	21.53	499.5	584
49.0	6377.239	-80.5548	28.3593	103.74	72.11	198.5	91.77	21.96	505.3	643
50.0	6377.431	-80.5542	28.3591	103.87	71.51	205.2	91.89	22.38	511.2	706
51.0	6377.628	-80.5535	28.3590	104.01	70.92	212.0	92.02	22.79	517.2	773
52.0	6377.832	-80.5528	28.3588	104.11	70.38	219.1	92.14	23.22	523.3	844
53.0	6378.041	-80.5521	28.3587	104.05	69.82	226.1	92.24	23.62	529.7	920
54.0	6378.256	-80.5513	28.3585	104.01	69.27	233.4	92.34	24.02	536.3	1001
55.0	6378.478	-80.5504	28.3583	103.98	68.68	240.8	92.45	24.39	543.2	1086
56.0	6378.705	-80.5495	28.3581	103.98	68.10	248.3	92.57	24.75	550.2	1176
57.0	6378.938	-80.5486	28.3579	103.93	67.54	256.0	92.67	25.11	557.5	1271
58.0	6379.178	-80.5476	28.3576	103.86	66.99	263.8	92.77	25.46	564.9	1372
59.0	6379.424	-80.5465	28.3574	103.77	66.45	271.8	92.88	25.80	572.6	1478
60.0	6379.676	-80.5454	28.3572	103.67	65.92	280.0	92.97	26.13	580.4	1589
61.0	6379.935	-80.5443	28.3569	103.58	65.38	288.3	93.07	26.44	588.5	1706
62.0	6380.200	-80.5431	28.3566	103.56	64.85	296.7	93.18	26.75	596.7	1830
63.0	6380.472	-80.5428	28.3564	103.60	64.31	305.2	93.31	27.03	605.0	1959
64.0	6380.750	-80.5404	28.3561	103.69	63.79	313.7	93.45	27.31	613.4	2094
65.0	6381.035	-80.5390	28.3558	103.74	63.28	322.2	93.58	27.57	621.9	2236
		MACH ONE								7712
65.500	6381.179	-80.5383	28.3556	103.75	63.02	326.5	93.64	27.69	626.2	2309
66.0	6381.326	-80.5376	28.3554	103.75	62.76	330.8	93.70	27.81	630.6	2384
67.0	6381.623	-80.5360	28.3551	103.76	62.24	339.4	93.82	28.02	639.3	2539

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
68.0	6381.926	-80.5344	28.3547	103.79	61.72	348.1	93.95	28.23	648.2	2701	8603
69.0	6382.236	-80.5328	28.3544	103.84	61.20	357.0	94.08	28.42	657.2	2869	8913
70.0	6382.552	-80.5310	28.3540	103.87	60.70	366.0	94.21	28.61	666.5	3045	9229
71.0	6382.874	-80.5292	28.3536	103.88	60.22	375.3	94.33	28.81	675.9	3227	9551
72.0	6383.203	-80.5273	28.3532	103.90	59.74	384.9	94.46	29.00	685.8	3418	9880
73.0	6383.539	-80.5254	28.3527	103.94	59.24	394.8	94.59	29.18	695.9	3615	10215
74.0	6383.882	-80.5233	28.3523	104.01	58.75	405.0	94.74	29.35	706.3	3821	10558
75.0	6384.231	-80.5212	28.3518	104.07	58.24	415.3	94.89	29.51	717.0	4035	10907
MAXIMUM DYNAMIC PRESSURE											
76.000	6384.588	-80.5190	28.3513	104.08	57.73	425.9	95.02	29.65	728.0	4258	11264
77.0	6384.951	-80.5167	28.3508	104.00	57.20	436.8	95.11	29.77	739.5	4490	11627
78.0	6385.322	-80.5143	28.3502	103.85	56.68	448.0	95.19	29.89	751.4	4731	11998
79.0	6385.700	-80.5118	28.3497	103.68	56.17	459.6	95.25	30.00	763.5	4982	12376
80.0	6386.085	-80.5093	28.3491	103.54	55.67	471.3	95.32	30.11	775.8	5242	12761
81.0	6386.479	-80.5066	28.3486	103.45	55.20	483.3	95.40	30.23	788.3	5513	13154
82.0	6386.879	-80.5038	28.3480	103.33	54.72	495.7	95.48	30.33	801.3	5794	13555
83.0	6387.288	-80.5009	28.3473	103.33	54.23	508.3	95.60	30.42	814.5	6085	13963
84.0	6387.704	-80.4979	28.3467	103.49	53.75	521.2	95.78	30.51	827.9	6387	14379
85.0	6388.129	-80.4948	28.3460	103.70	53.27	534.3	96.00	30.59	841.5	6700	14803
86.0	6388.561	-80.4916	28.3453	104.05	52.80	547.7	96.27	30.67	855.3	7025	15235
87.0	6389.001	-80.4882	28.3446	104.37	52.34	561.4	96.54	30.74	869.3	7362	15675
88.0	6389.450	-80.4848	28.3438	104.61	51.93	575.3	96.78	30.84	883.5	7710	16124
89.0	6389.907	-80.4812	28.3429	104.70	51.52	589.5	96.94	30.92	898.2	8070	16581
90.0	6390.373	-80.4776	28.3421	104.72	51.09	604.0	97.07	30.97	913.2	8443	17046
91.0	6390.847	-80.4738	28.3412	104.72	50.62	618.7	97.20	31.00	928.7	8828	17520
92.0	6391.330	-80.4698	28.3403	104.75	50.11	634.0	97.34	30.99	944.8	9227	18003
93.0	6391.820	-80.4658	28.3393	104.83	49.62	649.4	97.51	30.98	961.0	9639	18493
94.0	6392.319	-80.4615	28.3383	104.85	49.12	665.1	97.65	30.95	977.8	10067	18991
95.0	6392.826	-80.4572	28.3373	104.90	48.61	681.3	97.80	30.91	994.8	10508	19498
96.0	6393.342	-80.4527	28.3362	104.93	48.08	697.7	97.94	30.85	1012.3	10966	20013
97.0	6393.865	-80.4480	28.3351	105.03	47.56	714.5	98.12	30.79	1030.2	11439	20536
98.0	6394.397	-80.4432	28.3340	105.08	47.05	731.7	98.27	30.72	1048.4	11928	21067
99.0	6394.936	-80.4382	28.3328	105.11	46.54	749.2	98.42	30.65	1066.8	12433	21607
100.0	6395.481	-80.4330	28.3315	105.15	46.05	767.0	98.56	30.57	1085.6	12959	22151
101.0	6396.038	-80.4277	28.3302	105.18	45.56	785.1	98.69	30.49	1104.8	13498	22707
102.0	6396.603	-80.4222	28.3289	105.20	45.09	803.6	98.83	30.41	1124.2	14055	23272
103.0	6397.176	-80.4166	28.3275	105.23	44.63	822.4	98.96	30.33	1144.0	14629	23845
104.0	6397.759	-80.4107	28.3261	105.24	44.18	841.6	99.08	30.25	1164.1	15222	24427
105.0	6398.350	-80.4047	28.3246	105.26	43.73	861.1	99.20	30.16	1184.6	15833	25017
106.0	6398.950	-80.3985	28.3231	105.27	43.29	880.9	99.31	30.07	1205.4	16482	25617
107.0	6399.558	-80.3921	28.3216	105.27	42.86	901.1	99.43	29.98	1226.5	17111	26225

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
108.0	6400.176	-80.3856	28.3200	105.28	42.43	921.6	99.54	29.89	1248.0	17779	26842
109.0	6400.802	-80.3788	28.3183	105.28	42.01	942.5	99.64	29.79	1269.8	18467	27468
110.0	6401.438	-80.3718	28.3166	105.29	41.60	963.8	99.75	29.69	1292.0	19175	28103
111.0	6402.082	-80.3647	28.3149	105.29	41.19	985.4	99.85	29.58	1314.5	19903	28747
112.0	6402.736	-80.3573	28.3131	105.29	40.78	1007.3	99.95	29.47	1337.3	20652	29400
113.0	6403.399	-80.3497	28.3113	105.30	40.38	1029.6	100.05	29.36	1360.6	21423	30062
114.0	6404.070	-80.3419	28.3094	105.30	39.98	1052.3	100.15	29.24	1384.2	22215	30734
115.0	6404.751	-80.3339	28.3074	105.31	39.59	1075.4	100.25	29.13	1408.1	23029	31414
116.0	6405.442	-80.3257	28.3054	105.32	39.21	1098.8	100.34	29.01	1432.4	23865	32104
117.0	6406.141	-80.3172	28.3034	105.32	38.83	1122.6	100.43	28.89	1457.1	24724	32802
118.0	6406.850	-80.3085	28.3013	105.32	38.46	1146.8	100.52	28.76	1482.2	25606	33510
119.0	6407.568	-80.2996	28.2991	105.32	38.09	1171.3	100.61	28.64	1507.6	26512	34228
120.0	6408.295	-80.2905	28.2969	105.32	37.72	1196.3	100.69	28.51	1533.4	27441	34955
121.0	6409.032	-80.2811	28.2946	105.33	37.36	1221.6	100.78	28.38	1559.6	28395	35691
122.0	6409.778	-80.2714	28.2922	105.33	37.01	1247.4	100.86	28.25	1586.2	29374	36436
123.0	6410.534	-80.2616	28.2898	105.34	36.66	1273.5	100.95	28.12	1613.2	30378	37191
124.0	6411.299	-80.2514	28.2874	105.34	36.31	1300.1	101.03	27.99	1640.6	31407	37956
125.0	6412.075	-80.2411	28.2848	105.35	35.97	1327.1	101.12	27.85	1668.4	32462	38730
126.0	6412.859	-80.2304	28.2823	105.36	35.64	1354.6	101.20	27.72	1696.7	33543	39514
127.0	6413.653	-80.2195	28.2796	105.37	35.30	1382.4	101.28	27.58	1725.3	34652	40307
128.0	6414.457	-80.2083	28.2769	105.37	34.98	1410.7	101.35	27.45	1754.4	35787	41110
129.0	6415.271	-80.1969	28.2741	105.38	34.65	1439.4	101.42	27.31	1783.9	36950	41923
130.0	6416.094	-80.1852	28.2712	105.38	34.33	1468.5	101.50	27.17	1813.8	38141	42746
131.0	6416.928	-80.1732	28.2683	105.38	34.01	1498.1	101.57	27.02	1844.2	39361	43578
132.0	6417.771	-80.1609	28.2653	105.39	33.68	1528.2	101.64	26.87	1875.1	40610	44420
133.0	6418.623	-80.1483	28.2622	105.40	33.37	1558.7	101.71	26.72	1906.4	41888	45272
134.0	6419.486	-80.1355	28.2591	105.40	33.05	1589.7	101.78	26.57	1938.2	43197	46133
135.0	6420.358	-80.1223	28.2559	105.41	32.73	1621.2	101.85	26.42	1970.5	44536	47004
136.0	6421.239	-80.1088	28.2526	105.42	32.42	1653.3	101.92	26.26	2003.3	45906	47885
137.0	6422.130	-80.0950	28.2492	105.43	32.10	1685.7	101.99	26.10	2036.5	47307	48707
138.0	6423.031	-80.0809	28.2457	105.43	31.79	1718.6	102.05	25.94	2070.2	48741	49675
139.0	6423.942	-80.0665	28.2422	105.44	31.49	1752.1	102.12	25.78	2104.5	50208	50584
140.0	6424.862	-80.0518	28.2386	105.45	31.20	1786.1	102.18	25.63	2139.2	51707	51503
141.0	6425.792	-80.0367	28.2349	105.46	30.92	1820.5	102.24	25.48	2174.3	53240	52432
INBOARD ENGINE CUTOFF											
141.460	6426.224	-80.0297	28.2332	105.46	30.80	1836.6	102.27	25.42	2190.7	53957	52863

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
OUTBOARD ENGINE CUT OFF											
146.940	6431.409	-79.9426	28.2118	105.53	29.49	1927.6	102.48	24.53	2285.3	6281.6	58042
147.0	6431.466	-79.9416	28.2116	105.53	29.48	1928.5	102.48	24.52	2286.3	6291.6	58099
S-1B/S-IVB SEPARATION											
147.740	6432.169	-79.9294	28.2086	105.54	29.31	1929.1	102.49	24.38	2287.4	6415.5	58801
148.0	6432.417	-79.9251	28.2075	105.54	29.25	1928.0	102.50	24.33	2286.5	6459.7	59049
149.0	6433.355	-79.9087	28.2034	105.56	29.02	1923.7	102.51	24.13	2282.9	66264	59986
150.0	6434.284	-79.8923	28.1994	105.57	28.79	1919.3	102.52	23.93	2279.1	67931	60913
155.0	6438.812	-79.8103	28.1791	105.62	27.66	1916.0	102.58	22.97	2279.3	7628.4	63434
160.0	6443.191	-79.7272	28.1585	105.67	26.57	1928.1	102.66	22.07	2294.5	84750	69808
165.0	6447.439	-79.6428	28.1375	105.72	25.49	1943.6	102.73	21.20	2313.0	93353	74049
170.0	6451.559	-79.5570	28.1160	105.77	24.43	1960.6	102.82	20.34	2332.8	10210.1	78162
175.0	6455.554	-79.4698	28.0942	105.82	23.41	1979.5	102.90	19.51	2354.3	110996	82150
INTRODUCE GUIDANCE											
176.110	6456.423	-79.4502	28.0893	105.83	23.18	1983.9	102.91	19.33	2359.2	112991	83018
180.0	6459.425	-79.3811	28.0719	105.87	22.41	1999.8	102.98	18.71	2377.0	120043	86014
185.0	6463.181	-79.2990	28.0492	105.92	21.51	2020.7	103.06	17.98	2400.0	129242	89764
190.0	6466.839	-79.1996	28.0260	105.98	20.73	2041.8	103.14	17.36	2422.9	138585	93414
195.0	6470.411	-79.1068	28.0024	106.03	20.01	2063.0	103.22	16.78	2445.8	148066	96979
200.0	6473.899	-79.0127	27.9784	106.09	19.30	2085.4	103.30	16.21	2469.7	157686	100460
205.0	6477.305	-78.9173	27.9540	106.15	18.61	2108.7	103.38	15.65	2494.5	167448	103858
210.0	6480.627	-78.8205	27.9291	106.22	17.92	2132.9	103.47	15.09	2520.0	177356	107173
215.0	6483.868	-78.7223	27.9037	106.30	17.24	2157.9	103.57	14.55	2546.4	187413	110405
220.0	6487.025	-78.6227	27.8778	106.38	16.59	2184.0	103.68	14.02	2573.7	197621	113555
225.0	6490.103	-78.5216	27.8514	106.47	15.95	2210.9	103.78	13.50	2601.8	207983	116664
230.0	6493.100	-78.4191	27.8244	106.55	15.32	2238.7	103.88	13.00	2630.6	218503	119613
235.0	6496.019	-78.3151	27.7970	106.64	14.72	2267.2	103.99	12.51	2660.2	229182	122524
240.0	6498.861	-78.2096	27.7689	106.72	14.13	2296.6	104.09	12.03	2690.5	240023	125357
245.0	6501.626	-78.1026	27.7403	106.80	13.56	2326.7	104.19	11.56	2721.5	251028	128114
250.0	6504.317	-77.9940	27.7112	106.89	13.01	2357.8	104.30	11.12	2753.4	262201	130796
255.0	6506.936	-77.8838	27.6814	106.97	12.48	2389.6	104.40	10.68	2786.1	273543	134305
260.0	6509.442	-77.7721	27.6511	107.05	11.97	2422.4	104.51	10.26	2819.6	285059	135942
265.0	6511.959	-77.6587	27.6202	107.14	11.47	2456.0	104.61	9.85	2853.8	296751	138410
270.0	6514.367	-77.5437	27.5886	107.22	10.99	2490.1	104.71	9.46	2888.5	308621	140808
275.0	6516.706	-77.4270	27.5564	107.30	10.52	2524.4	104.82	9.07	2923.4	320671	143137

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
280.0	6518.975	-77.3087	27.5236	107.39	10.06	2558.2	104.92	8.69	2957.9	332898	145396
285.0	6521.175	-77.1888	27.4902	107.47	9.62	2590.5	105.02	8.33	2990.6	345298	147585
290.0	6523.306	-77.0674	27.5561	107.56	9.20	2622.9	105.12	7.97	3023.5	357864	149706
295.0	6525.368	-76.9444	27.4214	107.65	8.78	2655.6	105.23	7.62	3056.6	370599	151758
300.0	6527.360	-76.8200	27.3862	107.73	8.37	2688.3	105.33	7.27	3089.8	383502	153739
305.0	6529.280	-76.6940	27.3502	107.82	7.96	2720.8	105.43	6.93	3122.7	396512	155647
310.0	6531.129	-76.5665	27.3137	107.91	7.58	2753.7	105.53	6.61	3155.9	409808	157486
315.0	6532.913	-76.4375	27.2765	108.00	7.23	2787.1	105.63	6.31	3189.7	423213	159258
320.0	6534.637	-76.3070	27.2387	108.09	6.91	2821.8	105.74	6.04	3224.7	436788	160971
325.0	6536.308	-76.1749	27.2002	108.17	6.61	2858.1	105.84	5.79	3261.2	450541	162630
330.0	6537.929	-76.0411	27.1610	108.26	6.34	2896.0	105.94	5.56	3299.3	464477	164239
335.0	6539.505	-75.9056	27.1211	108.35	6.07	2935.3	106.05	5.34	3338.8	478605	165803
340.0	6541.036	-75.7684	27.0894	108.44	5.82	2976.4	106.15	5.13	3380.1	492930	167322
345.0	6542.526	-75.6292	27.0390	108.52	5.58	3018.7	106.25	4.92	3422.6	507461	168799
350.0	6543.974	-75.4882	26.9968	108.61	5.35	3061.8	106.36	4.73	3465.9	522202	170234
355.0	6545.382	-75.3453	26.9538	108.69	5.13	3105.2	106.46	4.53	3509.5	537155	171629
360.0	6546.749	-75.2005	26.9100	108.78	4.91	3148.8	106.56	4.35	3553.2	552321	172983
365.0	6548.077	-75.0538	26.8653	108.86	4.70	3192.9	106.66	4.17	3597.4	567701	174297
370.0	6549.368	-74.9051	26.8199	108.95	4.51	3237.7	106.77	4.01	3642.3	583298	175574
375.0	6550.625	-74.7545	26.7736	109.04	4.33	3283.2	106.87	3.86	3687.9	599115	176818
380.0	6551.850	-74.6019	26.7264	109.12	4.17	3329.5	106.97	3.72	3734.3	615155	178029
385.0	6553.046	-74.4473	26.6784	109.21	4.02	3376.5	107.08	3.58	3781.5	631422	179210
390.0	6554.216	-74.2907	26.6295	109.30	3.87	3424.3	107.18	3.46	3829.3	647919	180365
395.0	6555.360	-74.1320	26.5796	109.39	3.74	3472.6	107.29	3.35	3877.7	664468	181495
400.0	6556.482	-73.9712	26.5289	109.48	3.62	3521.4	107.40	3.24	3926.6	681613	182601
405.0	6557.584	-73.8084	26.4771	109.57	3.51	3571.2	107.50	3.15	3976.4	698816	183688
410.0	6558.667	-73.6434	26.4245	109.66	3.41	3621.7	107.61	3.06	4027.0	716262	184756
415.0	6559.737	-73.4762	26.3708	109.76	3.32	3673.0	107.72	2.99	4078.3	739533	185809
420.0	6560.794	-73.3069	26.3162	109.85	3.07	3725.2	107.83	2.92	4130.5	751893	186850
425.0	6561.843	-73.1354	26.2605	109.94	3.18	3778.7	107.93	2.87	4184.5	770089	187882
430.0	6562.888	-72.9615	26.2038	110.03	3.13	3833.6	108.04	2.83	4239.0	788545	188911
435.0	6563.935	-72.7854	26.1460	110.13	3.09	3889.7	108.15	2.80	4295.2	807268	189941
440.0	6564.989	-72.6069	26.0871	110.22	3.07	3947.2	108.26	2.79	4352.6	826265	190977
445.0	6566.054	-72.4260	26.0271	110.31	3.07	4005.2	108.37	2.79	4410.7	845538	192024
450.0	6567.134	-72.2426	25.9659	110.41	3.07	4063.8	108.48	2.79	4469.3	865091	193086
455.0	6568.233	-72.0569	25.9036	110.50	3.09	4122.6	108.59	2.81	4528.2	884926	194167
460.0	6569.353	-71.8687	25.8401	110.60	3.10	4181.4	108.70	2.83	4587.0	905042	195269
465.0	6570.496	-71.6781	25.7754	110.70	3.12	4240.9	108.81	2.85	4646.5	92540	196392
470.0	6571.661	-71.4851	25.7095	110.79	3.14	4300.9	108.93	2.86	4706.4	946124	197538
475.0	6572.848	-71.2896	25.6424	110.89	3.15	4361.8	109.04	2.88	4767.4	967096	198706
480.0	6574.058	-71.0916	25.5741	110.99	3.16	4424.2	109.15	2.90	4829.8	988363	199895
485.0	6575.291	-70.8911	25.5045	111.09	3.18	4488.2	109.27	2.92	4893.9	1009931	201108
490.0	6576.550	-70.6879	25.4335	111.19	3.21	4554.1	109.38	2.94	4959.7	1031809	202346
495.0	6577.840	-70.4821	25.3612	111.29	3.25	4621.6	109.50	2.98	5027.3	1054004	203616

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE NM	ALTITUDE M
500.0	6579.170	-70.2735	25.2875	111.40	3.31	4690.8	109.61	3.04	5096.5	1076525	204924
505.0	6580.549	-70.0621	25.2124	111.50	3.39	4761.0	109.73	3.12	5166.7	1099378	206282
510.0	6581.988	-69.8479	25.1358	111.60	3.49	4831.9	109.85	3.22	5237.6	1122564	207699
515.0	6583.498	-69.6309	25.0578	111.70	3.62	4903.3	109.96	3.34	5309.0	1146086	209186
520.0	6585.091	-69.4110	24.9783	111.81	3.78	4977.1	110.08	3.49	5382.9	1169949	210756
525.0	6586.781	-69.1882	24.8972	111.91	3.96	5054.2	110.20	3.66	5459.9	1194166	212423
530.0	6588.585	-68.9624	24.8146	112.01	4.17	5133.6	110.32	3.86	5539.3	1218748	214203
535.0	6590.522	-68.7334	24.7303	112.12	4.43	5214.3	110.44	4.11	5620.0	1243704	216116
540.0	6592.618	-68.5014	24.6443	112.22	4.73	5295.2	110.56	4.39	5700.8	1269033	218188
545.0	6594.898	-68.2663	24.5568	112.33	5.08	5375.7	110.67	4.73	5781.2	1294730	220444
550.0	6597.386	-68.0283	24.4676	112.43	5.46	5456.1	110.79	5.08	5861.5	1320790	222906
555.0	6600.094	-67.7873	24.3767	112.54	5.84	5538.3	110.91	5.44	5943.6	1347213	225588
560.0	6603.023	-67.5432	24.2841	112.65	6.21	5624.8	111.04	5.79	6030.0	1374012	228492
565.0	6606.167	-67.2959	24.1897	112.76	6.52	5716.2	111.16	6.09	6121.3	1401207	231609
570.0	6609.505	-67.0452	24.0934	112.87	6.77	5813.5	111.28	6.33	6218.6	1428826	234920
575.0	6613.010	-66.7907	23.9951	112.98	6.95	5916.2	111.41	6.50	6321.3	1456896	238397
580.0	6616.667	-66.5324	23.8946	113.09	7.14	6021.8	111.54	6.69	6427.0	1485440	242027
585.0	6620.504	-66.2702	23.7920	113.21	7.38	6129.0	111.67	6.92	6534.2	1514463	245836
590.0	6624.550	-66.0040	23.6872	113.32	7.65	6238.4	111.80	7.18	6643.5	1543970	249856
595.0	6628.817	-65.7339	23.5801	113.44	7.94	6351.3	111.93	7.46	6756.4	1573973	254090
600.0	6633.331	-65.4597	23.4708	113.56	8.25	6467.1	112.06	7.76	6872.1	1604474	258574
S-IVB CUTOFF											
602.860	6636.029	-65.3010	23.4072	113.62	8.44	6534.6	112.14	7.94	6939.5	1622150	261255
605.0	6638.084	-65.1817	23.3592	113.68	8.43	6538.9	112.19	7.94	6944.0	1635448	263297
610.0	6642.853	-64.9037	23.2468	113.81	8.35	6532.4	112.31	7.86	6937.8	1666486	268035
620.0	6652.252	-64.3504	23.0208	114.07	8.20	6519.5	112.55	7.72	6925.6	1727373	286514
630.0	6661.454	-63.8008	22.7932	114.32	8.04	6506.9	112.78	7.57	6913.7	1790182	285460
640.0	6670.462	-63.2548	22.5641	114.57	7.89	6494.6	113.00	7.42	6902.0	1851756	304213
650.0	6679.275	-62.7123	22.3335	114.81	7.73	6482.6	113.23	7.27	6890.6	1917438	312771
660.0	6687.894	-62.1733	22.1014	115.05	7.57	6470.8	113.45	7.11	6879.5	2035453	321133
670.0	6696.317	-61.6377	21.8679	115.29	7.41	6459.3	113.67	6.96	6868.6	2096358	329300
680.0	6704.544	-61.1054	21.6329	115.53	7.24	6448.2	113.88	6.81	6858.0	2157108	337269
690.0	6712.574	-60.5763	21.3966	115.76	7.08	6437.3	114.09	6.65	6847.7	2217707	345041
700.0	6720.406	-60.0504	21.1589	115.98	6.91	6426.8	114.29	6.50	6837.7	2278162	352612
710.0	6728.037	-59.5276	20.9198	116.21	6.74	6416.6	114.50	6.34	6828.1	2338478	359985
720.0	6735.469	-59.0079	20.6795	116.43	6.57	6406.6	114.70	6.18	6818.6	2398658	367161
730.0	6742.705	-58.4911	20.4378	116.64	6.41	6396.8	114.89	6.02	6809.3	2458701	374145
740.0	6749.748	-57.9772	20.1949	116.85	6.24	6387.2	115.09	5.86	6800.2	2518610	380933
750.0	6756.595	-57.4663	19.9508	117.06	6.07	6377.9	115.28	5.70	6791.4	2578397	387519
760.0	6763.240	-56.9582	19.7054	117.27	5.90	6369.0	115.46	5.54	6782.9	2638043	393898
770.0	6769.678	-56.4529	19.4589	117.47	5.73	6360.2	115.65	5.37	6774.7		

TABLE VIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
780.0	6775.916	-55.9501	19.2112	117.67	5.55	6351.9	115.83	5.21	6766.7	2697590	400079
790.0	6781.968	-55.4500	18.9623	117.87	5.38	6343.7	116.01	5.05	6758.9	2757024	406073
800.0	6787.824	-54.9526	18.7123	118.06	5.21	6335.8	116.18	4.88	6751.5	2816337	411871
810.0	6793.463	-54.4576	18.4612	118.25	5.03	6328.2	116.35	4.72	6744.3	2875533	417454
820.0	6798.909	-53.9650	18.2090	118.44	4.85	6320.9	116.52	4.55	6737.3	2934661	422843
830.0	6804.170	-53.4748	17.9558	118.62	4.68	6313.8	116.69	4.39	6730.7	2993610	428048
840.0	6809.208	-52.9870	17.7015	118.80	4.50	6307.1	116.85	4.22	6724.2	3052581	433030
<hr/>											
<b>S-IVB/CSM SEPARATION</b>											
844.950	6811.631	-52.7464	17.5752	118.89	4.41	6303.8	116.93	4.14	6721.1	3081716	435426

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	X <sub>E</sub> FT	Y <sub>E</sub> FT	Z <sub>E</sub> FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
<b>GUIDANCE REFERENCE RELEASE</b>									
-5.038	0	105	0	0.0	0.0	0.0	0.00	0.00	0.00
0.0	0	105	0	0.0	0.0	0.0	0.00	0.00	0.00
<b>FIRST MOTION</b>									
0.110	0	105	0	-0.0	-0.0	-0.0	-1.08	6.42	-0.21
<b>LIFTOFF SIGNAL</b>									
0.370	0	105	0	-0.2	1.7	-0.0	-0.82	6.55	-0.17
1.0	0	108	0	-0.6	5.9	-0.1	-0.33	6.81	-0.07
2.0	-0	117	0	-0.7	12.9	-0.1	-0.13	7.17	0.03
3.0	-1	134	0	-0.4	20.2	-0.1	0.30	7.46	0.09
4.0	-1	158	0	-0.1	27.8	0.0	0.31	7.71	0.12
5.0	-1	189	0	0.1	35.6	0.2	0.21	7.92	0.12
6.0	-1	229	0	0.3	43.6	0.3	0.09	8.13	0.12
7.0	-0	277	0	0.3	51.9	0.4	-0.03	8.33	0.11
8.0	-0	333	1	0.2	60.3	0.5	-0.12	8.53	0.09
9.0	-0	397	1	0.1	68.9	0.6	-0.16	8.73	0.08
10.0	-0	471	2	-0.1	77.8	0.7	-0.14	8.95	0.08
11.0	-0	553	3	-0.2	86.8	0.7	-0.07	9.19	0.07
12.0	-0	644	3	-0.2	96.1	0.8	-0.04	9.43	0.08
13.0	-1	745	4	-0.1	105.7	0.9	0.20	9.69	0.08
14.0	-1	856	5	0.2	115.5	1.0	0.37	9.95	0.09
15.0	-1	976	6	0.7	125.6	1.1	0.56	10.23	0.10
16.0	-0	1107	7	1.4	136.0	1.2	0.76	10.51	0.11
17.0	-1	1248	9	2.2	146.6	1.3	0.95	10.79	0.12
18.0	3	1400	10	3.3	157.6	1.4	1.13	11.08	0.12
19.0	7	1564	11	4.5	168.8	1.5	1.31	11.36	0.12
20.0	12	1738	13	5.9	180.3	1.6	1.47	11.63	0.11
21.0	19	1924	15	7.4	192.0	1.8	1.62	11.90	0.10
22.0	27	2122	17	9.1	204.1	1.8	1.77	12.17	0.08
23.0	37	2332	18	11.0	216.4	1.9	1.94	12.42	0.05
24.0	49	2555	20	13.0	228.9	1.9	2.13	12.67	0.01
25.0	63	2790	22	15.2	241.7	1.9	2.35	12.91	-0.02
26.0	79	3038	24	17.7	254.7	1.9	2.63	13.14	-0.07
27.0	98	3300	26	20.5	268.0	1.8	2.96	13.36	-0.11
28.0	120	3575	28	23.7	281.5	1.7	3.36	13.59	-0.15

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
29.0	3863	29	27.3	295.2	1.5	3.84	13.81	-0.19	
30.0	4165	31	31.4	309.1	1.3	4.38	14.03	-0.22	
31.0	4481	32	36.0	323.2	1.1	4.97	14.26	-0.24	
32.0	4811	33	41.3	337.6	0.8	5.59	14.50	-0.24	
33.0	5156	34	47.2	352.2	0.6	6.20	14.74	-0.23	
34.0	5516	34	53.7	367.1	0.4	6.75	15.01	-0.19	
35.0	5891	34	60.3	382.4	0.0	6.40	15.20	-0.06	
36.0	6281	34	66.9	397.7	0.3	6.85	15.67	0.17	
37.0	6686	35	74.2	413.5	0.2	7.54	15.70	0.12	
38.0	613	7108	35	81.7	429.3	0.6	7.93	16.00	0.03
39.0	699	7545	35	90.3	445.4	0.0	8.89	16.36	-0.56
40.0	793	7999	35	99.4	462.0	-0.3	9.22	16.33	-0.39
41.0	897	8469	34	108.8	478.2	-1.0	9.35	16.80	-0.36
42.0	1011	8956	33	118.1	495.5	-1.1	9.76	17.05	-0.33
43.0	1134	9460	32	128.6	512.4	-1.7	10.33	17.11	-0.14
44.0	1267	9981	31	138.8	529.7	-1.5	11.01	17.38	-0.10
45.0	1412	10520	29	150.4	547.2	-1.9	11.36	17.72	-0.34
46.0	1568	11076	27	161.8	565.2	-2.1	12.15	17.78	-0.45
47.0	1736	11650	24	174.5	582.9	-2.6	12.57	18.14	-0.11
48.0	1916	12242	22	187.0	601.3	-2.6	13.17	18.27	-0.21
49.0	2110	12852	19	200.5	619.7	-2.7	13.30	18.56	-0.22
50.0	2317	13481	17	214.0	638.3	-2.5	13.93	18.64	0.11
51.0	2538	14129	14	227.9	657.2	-2.1	13.85	19.26	0.42
52.0	2773	14796	12	241.9	676.8	-1.9	14.24	19.49	-0.12
53.0	3022	15483	10	256.6	696.2	-2.4	14.87	19.58	-0.44
54.0	3286	16189	7	271.6	715.9	-2.8	15.56	19.83	-0.36
55.0	3565	16915	5	287.8	735.7	-3.1	16.83	19.82	-0.30
56.0	3862	17660	2	304.5	755.5	-3.4	17.16	20.01	-0.43
57.0	4175	18426	-0	321.4	775.8	-3.9	17.52	20.28	-0.66
58.0	4505	19211	-4	338.9	796.3	-4.6	18.11	20.67	-0.82
59.0	4853	20018	-9	357.0	817.1	-5.4	18.60	20.93	-0.85
60.0	5219	20848	-14	375.6	838.4	-6.5	19.06	21.13	-0.98
61.0	5605	21694	-21	394.8	859.4	-7.5	19.59	21.13	-0.82
62.0	6010	22564	-28	414.4	880.6	-8.1	20.18	21.10	-0.33
63.0	6434	23455	-36	434.8	901.8	-8.2	20.54	21.10	0.10
64.0	6879	24367	-43	455.3	922.9	-8.0	20.80	21.03	0.10
65.0	7345	25301	-51	476.3	943.8	-8.0	21.23	20.77	-0.10
		MACH @NE							
65.500	7586	25775	-55	487.0	954.2	-8.1	21.46	20.67	-0.16
66.0	7832	26255	-59	497.7	964.5	-8.3	21.69	20.57	-0.23
67.0	8341	27229	-67	519.7	984.9	-8.7	22.21	20.41	-0.20

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
68.0	8872	28224	-75	542.3	1005.2	-8.8	22.74	20.34	0.03
69.0	9426	29240	-83	565.3	1025.6	-8.8	23.20	20.67	0.07
70.0	10003	30275	-92	588.8	1046.5	-8.9	23.62	21.23	-0.10
71.0	10604	31332	-100	612.8	1068.0	-9.2	24.28	21.75	-0.16
72.0	11229	32411	-109	637.8	1090.0	-9.4	25.26	22.21	0.03
73.0	11880	33512	-118	663.8	1112.4	-9.4	26.21	22.51	0.30
74.0	12557	34635	-127	690.7	1135.0	-9.1	27.03	22.60	0.43
75.0	13261	35781	-135	718.5	1157.6	-8.7	28.08	22.77	0.10
<hr/>									
MAXIMUM DYNAMIC PRESSURE									
76.000	13994	36950	-144	747.6	1180.5	-9.1	29.30	23.06	-0.79
77.0	14757	38142	-153	777.9	1203.6	-10.6	30.35	23.39	-1.94
78.0	15551	39357	-165	809.2	1227.1	-13.3	31.14	23.82	-2.59
79.0	16376	40596	-179	841.2	1251.2	-16.2	31.76	24.34	-2.66
80.0	17293	41859	-196	873.7	1275.8	-19.2	32.38	24.84	-2.53
81.0	18123	43147	-216	906.6	1300.6	-21.4	33.54	25.21	-2.73
82.0	19047	44461	-239	941.0	1326.2	-24.3	35.15	25.41	-2.32
83.0	20006	45800	-265	976.5	1351.5	-25.2	35.89	25.64	0.54
84.0	21000	47165	-289	1013.0	1377.3	-23.5	37.04	25.66	2.11
85.0	22032	48555	-311	1050.5	1403.0	-20.6	37.86	26.06	4.53
86.0	23101	49972	-329	1089.0	1429.3	-14.8	39.12	26.24	5.97
87.0	24210	51414	-341	1128.0	1455.9	-9.0	38.67	27.21	5.23
88.0	25358	52884	-348	1166.7	1483.7	-4.6	39.09	28.10	3.22
89.0	26544	54382	-351	1206.4	1511.8	-3.0	40.43	27.87	0.47
90.0	27771	55908	-354	1247.8	1539.3	-2.9	42.31	27.37	-0.20
91.0	29041	57461	-357	1291.2	1566.4	-2.9	45.01	26.74	0.19
92.0	30355	59041	-359	1337.3	1593.0	-2.5	46.16	26.77	1.10
93.0	31715	60648	-361	1383.7	1619.9	-0.8	47.36	26.84	1.05
94.0	33123	62281	-362	1432.0	1646.6	-0.5	49.01	26.73	0.75
95.0	34580	63941	-362	1481.8	1673.3	0.7	50.86	26.43	0.92
96.0	36088	65628	-361	1533.4	1699.6	1.4	52.23	26.40	1.72
97.0	37647	67341	-358	1586.3	1726.1	3.9	53.71	26.56	2.07
98.0	39261	69081	-354	1640.3	1752.9	5.3	54.32	26.89	1.20
99.0	40929	70848	-348	1695.3	1779.7	6.4	55.74	26.82	1.07
100.0	42662	72630	-331	1751.5	1806.6	7.5	56.56	27.38	1.14
101.0	44442	74451	-322	1808.6	1834.1	8.5	57.57	27.62	0.95
102.0	46279	76300	-313	1866.8	1861.8	9.5	58.62	27.83	0.83
103.0	48175	78176	-303	1926.0	1889.8	10.3	59.74	28.02	0.76
104.0	50131	80081	-293	1986.3	1917.9	11.1	60.88	28.22	0.70
105.0	52148	82013	-281	2047.7	1946.2	11.7	62.01	28.41	0.62
106.0	54227	83974	-269	2110.3	1974.7	12.2	63.16	28.61	0.53
107.0	56369	85964	-257	2174.0	2003.4	12.7	64.32	28.79	0.46

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
108.0	58575	87983	-244	2238.9	2032.3	13.1	65.51	28.94	0.36
109.0	60847	90030	-231	2305.1	2061.2	13.5	66.74	29.02	0.28
110.0	63186	92107	-217	2372.5	2090.3	13.8	68.00	29.08	0.24
111.0	65592	94212	-203	2441.1	2119.4	14.0	69.26	29.15	0.25
112.0	68068	96347	-189	2510.9	2148.6	14.3	70.53	29.22	0.29
113.0	70615	98511	-174	2582.1	2177.9	14.7	71.86	29.30	0.45
114.0	73233	100704	-159	2654.7	2207.3	15.2	73.16	29.42	0.57
115.0	75925	102927	-144	2728.4	2236.7	15.7	74.42	29.53	0.52
116.0	78691	105179	-128	2803.5	2266.3	16.1	75.66	29.65	0.37
117.0	81532	107461	-112	2879.8	2296.0	16.3	76.93	29.76	0.23
118.0	84451	109772	-95	2957.3	2325.8	16.5	78.23	29.84	0.14
119.0	87448	112114	-79	3036.2	2355.7	16.7	79.56	29.92	0.11
120.0	90524	114485	-62	3116.5	2385.6	16.9	80.90	29.99	0.17
121.0	93682	116886	-45	3198.1	2415.7	17.2	82.28	30.08	0.29
122.0	96921	119318	-28	3281.1	2445.8	17.6	83.68	30.19	0.45
123.0	100245	121780	-10	3365.5	2476.1	18.1	85.15	30.29	0.63
124.0	103653	124271	7	3451.3	2506.4	18.6	86.60	30.42	0.74
125.0	107148	126794	26	3538.6	2536.9	19.3	88.01	30.55	0.69
126.0	110732	129347	46	3627.3	2567.5	19.9	89.40	30.64	0.49
127.0	114404	131930	66	3717.4	2598.2	20.4	90.84	30.69	0.34
128.0	118168	134544	87	3809.0	2628.9	20.7	92.36	30.69	0.28
129.0	122023	137189	107	3902.2	2659.5	21.0	93.93	30.65	0.25
130.0	125973	139865	128	3996.9	2690.1	21.2	95.55	30.57	0.26
131.0	130019	142571	150	4093.4	2720.7	21.5	97.31	30.37	0.30
132.0	134162	145307	171	4191.5	2751.0	21.9	99.05	30.38	0.51
133.0	138403	148074	193	4291.4	2781.4	22.4	100.76	30.21	0.44
134.0	142746	150871	216	4392.9	2811.5	22.9	102.45	30.03	0.48
135.0	147190	153698	239	4496.2	2841.6	23.5	103.81	30.25	0.66
136.0	151739	156555	262	4601.6	2871.5	24.0	105.45	29.89	0.69
137.0	156393	159442	287	4708.6	2901.0	24.6	107.05	29.63	0.72
138.0	161156	162358	312	4817.2	2930.5	25.1	108.66	29.69	0.72
139.0	166028	165303	337	4927.4	2960.4	25.8	110.27	30.12	0.75
140.0	171011	168280	363	5039.1	2991.0	26.3	111.88	30.91	0.79
141.0	176106	171287	390	5151.6	3022.6	27.0	113.48	32.02	0.79
INBOARD ENGINE CUTOFF									
141.460	178488	172681	403	5204.2	3037.3	27.4	114.21	32.64	0.82

TIME SEC	XE FT	YE FT	ZE FT	EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS				DDYE FT/S SQ	DDZE FT/S SQ
				DXE FT/S	DYE FT/S	DZE FT/S	DDZE FT/S SQ		
<b>OUTBOARD ENGINE CUTOFF</b>									
146.940	207962	189402	561	5537.5	3054.6	30.9	57.74	1.28	0.49
147.0	208294	189585	563	5540.9	3054.8	31.0	57.74	1.25	0.49
<b>S-IB/S-IVB SEPARATION</b>									
147.740	212419	191848	586	5552.1	3038.0	31.4	2.57	-29.25	0.13
148.0	213889	192646	595	5552.4	3030.2	31.6	1.87	-29.53	0.10
149.0	219442	195662	627	5552.7	3000.1	32.1	0.03	-30.28	0.10
150.0	224995	198648	659	5552.5	2969.6	32.5	-0.43	-30.58	0.10
155.0	252336	213167	825	51604.2	2847.2	33.9	17.22	-20.44	0.23
160.0	281082	227160	996	5696.9	2749.3	34.9	20.14	-19.00	0.26
165.0	309819	240675	1173	5797.7	2655.0	35.9	20.44	-18.77	0.26
170.0	339063	253724	1354	5900.1	2562.3	37.4	20.70	-18.57	0.26
175.0	368827	266312	1544	6005.8	2471.6	38.5	20.96	-18.37	0.30
<b>INTRODUCE GUIDANCE</b>									
176.110	375506	269042	1588	6029.6	2451.5	38.7	21.56	-17.93	0.18
180.0	399124	278443	1740	6113.3	2382.1	39.5	21.23	-17.60	0.13
185.0	429953	290144	1941	6217.4	2300.7	41.2	20.13	-15.23	0.33
190.0	461290	301467	2151	6311.5	2229.8	42.9	19.36	-13.45	0.41
195.0	493113	312449	2370	6413.3	2163.3	44.6	19.62	-13.34	0.34
200.0	525428	323099	2598	6512.5	2096.5	46.8	20.07	-13.23	0.48
205.0	558242	334343	2836	6611.6	2029.6	48.6	20.41	-13.44	0.54
210.0	591567	343393	3087	6716.7	1962.1	51.8	20.80	-13.46	0.85
215.0	625412	353034	3357	6821.5	1894.1	56.4	21.09	-13.62	1.00
220.0	659786	362335	3652	6928.5	1826.5	61.5	21.42	-13.57	1.05
225.0	694699	371299	3972	7036.9	1759.2	66.7	21.78	-13.55	1.00
230.0	730157	379926	4319	7146.9	1691.8	72.0	22.15	-13.47	0.96
235.0	766170	388217	4692	7258.3	1624.6	77.4	22.41	-13.50	0.98
240.0	802743	396173	5092	7371.4	1557.6	82.6	22.83	-13.22	1.10
245.0	839886	403794	5519	7485.9	1490.9	88.0	23.15	-13.24	1.11
250.0	877607	411083	5972	7602.5	1424.6	93.5	23.61	-13.21	1.12
255.0	915914	418041	6454	7720.8	1358.6	99.2	23.91	-13.16	1.20
260.0	954818	424670	6964	7841.0	1293.0	104.8	24.23	-13.23	1.11
265.0	994327	430970	7502	7962.8	1227.2	110.4	24.48	-13.22	1.07
270.0	1034448	436942	8068	8085.7	1161.3	116.0	24.45	-13.34	1.12
275.0	1075184	442582	8663	8208.5	1094.5	121.9	24.38	-13.60	1.09

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DOYE FT/S	DOZE FT/S	DOYE FT/S SQ	DOZE FT/S SQ
280.0	1116530	447884	9287	8329.3	1026.1	127.8	23.46	-13.77	1.24	
285.0	1158464	452846	9941	8443.6	958.8	134.0	22.67	-13.54	1.34	
290.0	1200968	451741	10626	8558.0	890.6	140.2	22.82	-13.78	1.22	
295.0	1244044	461750	11343	8672.5	820.8	146.3	23.17	-13.85	1.35	
300.0	1287693	465616	12090	8786.6	749.5	152.3	22.61	-14.46	1.11	
305.0	1331908	469244	12896	8899.5	677.6	158.6	22.58	-14.41	1.22	
310.0	1376688	472454	13675	9012.4	606.6	165.0	22.54	-14.00	1.41	
315.0	1422035	475316	14517	9126.7	538.7	171.7	23.17	-13.23	1.31	
320.0	1467960	477847	15392	9244.1	474.1	178.5	24.29	-12.45	1.49	
325.0	1514485	480062	16301	9366.0	411.9	185.2	24.76	-12.31	1.27	
330.0	1561630	481970	17244	9492.8	351.2	192.2	25.73	-12.10	1.41	
335.0	1609419	483574	18222	9623.9	290.4	198.9	26.64	-12.02	1.41	
340.0	1657877	484875	19234	9760.2	230.1	205.6	27.73	-12.04	1.32	
345.0	1707027	485873	20278	9900.2	169.2	212.2	28.25	-12.34	1.20	
350.0	1756883	486565	21355	10042.3	107.6	218.7	28.59	-12.36	1.32	
355.0	1807451	486948	22465	10185.2	45.2	225.3	28.70	-12.72	1.29	
360.0	1858735	487016	23608	10328.1	-18.2	231.8	28.86	-12.60	1.33	
365.0	1910736	486767	24784	10472.2	-81.2	238.6	28.95	-12.49	1.39	
370.0	1963462	486205	25994	10618.4	-143.7	245.5	29.66	-12.40	1.34	
375.0	2016925	485331	27239	10766.6	-206.1	252.4	29.82	-12.53	1.23	
380.0	2071134	484147	28518	10917.3	-267.7	259.4	30.36	-12.38	1.40	
385.0	2126101	482654	29833	11069.8	-329.6	266.5	30.77	-12.14	1.45	
390.0	2181836	480853	31184	11224.5	-391.0	273.9	31.10	-12.50	1.44	
395.0	2238348	478744	32572	11380.6	-452.6	281.3	31.51	-12.39	1.48	
400.0	2295644	476326	33998	11538.2	-514.7	288.8	31.87	-12.22	1.63	
405.0	2353735	473599	35460	11698.6	-576.2	296.4	32.38	-12.40	1.55	
410.0	2412634	470563	36962	11861.2	-637.7	304.1	32.90	-12.16	1.57	
415.0	2472351	467222	38502	12026.2	-698.9	311.9	33.92	-12.11	1.64	
420.0	2532900	463575	40082	12194.0	-759.8	319.9	33.93	-12.15	1.55	
425.0	2594298	459626	41701	12365.9	-819.8	327.9	34.76	-11.93	1.58	
430.0	2656567	455379	43361	12542.2	-878.5	336.0	35.70	-11.63	1.65	
435.0	2719727	450841	45062	12722.5	-936.6	344.3	36.72	-11.34	1.73	
440.0	2783800	446017	46804	12907.1	-992.9	352.4	37.24	-11.22	1.54	
445.0	2848802	440913	48587	13093.7	-1048.6	360.8	37.35	-11.04	1.73	
450.0	2914740	435532	50411	13281.8	-1103.5	369.2	37.99	-10.73	1.72	
455.0	2981621	429878	52279	13470.8	-1158.5	377.5	38.02	-11.09	1.66	
460.0	3049448	423946	54188	13659.2	-1214.5	386.1	37.65	-11.27	1.68	
465.0	3118220	417731	56140	13850.0	-1271.8	394.8	38.70	-11.45	1.81	
470.0	3187950	411226	58136	14041.7	-1331.3	403.8	38.62	-12.19	1.88	
475.0	3258644	404414	60177	14236.3	-1393.6	412.9	39.31	-12.64	1.81	
480.0	3330321	397287	62265	14435.4	-1457.9	422.1	40.22	-13.17	1.80	
485.0	340307	389832	64399	14639.7	-1524.3	431.6	41.25	-13.53	1.99	
490.0	3476729	382043	66580	14849.6	-1591.0	441.2	42.23	-13.34	2.03	
495.0	3551512	373923	688011	15065.1	-1656.6	451.0	43.81	-13.03	1.80	

**TABLE IX**  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
500.0	3627390	3654882	71090	15286.4	-1719.5	460.7	44.64	-12.16	1.94
505.0	3704383	356735	73418	15511.4	-1778.5	470.7	44.98	-11.54	2.05
510.0	3782506	347704	75797	15738.9	-1833.3	480.8	45.58	-10.67	1.94
515.0	3861774	338409	78226	15968.7	-1883.7	490.8	46.69	-9.58	2.03
520.0	3942210	328876	80705	16207.1	-1929.0	500.9	48.53	-8.66	1.91
525.0	4023864	319128	83235	16456.6	-1969.0	511.3	50.71	-7.62	2.03
530.0	4106790	309194	85818	16714.7	-2002.9	521.9	52.20	-5.84	2.08
535.0	4191022	299118	88454	16978.8	-2025.1	532.8	53.16	-2.90	2.35
540.0	4276582	288967	91144	17244.9	-2032.8	543.2	53.11	0.08	2.15
545.0	4363472	278812	93887	17511.0	-2026.8	554.1	53.11	2.01	2.12
550.0	4451694	268710	96685	17778.3	-2012.1	565.1	54.02	3.47	2.24
555.0	4541263	258686	99539	18050.9	-1996.9	576.6	55.68	2.69	2.32
560.0	4632227	248721	102450	18337.0	-1989.8	588.1	58.26	-0.02	2.31
565.0	4724654	238756	105421	18637.5	-1998.0	600.2	62.21	-4.00	2.63
570.0	4818625	228687	108454	18954.8	-2031.9	612.6	64.99	-9.33	2.64
575.0	4914216	218382	111550	19286.8	-2092.7	625.6	67.60	-13.92	2.68
580.0	5011493	207759	114714	19628.4	-2154.0	639.4	68.73	-10.53	2.75
585.0	5110497	196877	117947	19976.9	-2199.9	653.5	70.42	-8.05	2.91
590.0	5211271	185796	121251	20333.5	-2237.0	668.2	72.68	-6.68	3.00
595.0	5313866	174524	124626	20702.5	-2268.1	683.2	74.93	-5.81	3.02
600.0	5418320	163113	128084	21081.3	-2296.3	698.8	76.77	-5.18	3.08
S-IVB CUT OFF									
602.860	5478926	156524	130097	21302.2	-2310.1	708.0	77.82	-4.82	3.15
605.0	5524543	151532	131614	21311.1	-2359.5	711.1	7.25	-26.02	1.21
610.0	5631009	139410	135181	21274.5	-2489.4	717.1	-7.38	-25.95	1.21
620.0	5843406	113233	142412	21199.6	-2748.1	729.5	-7.55	-25.84	1.16
630.0	6055018	844667	149764	21122.6	-3005.2	740.9	-7.83	-25.62	1.21
640.0	6265848	53137	157231	21043.3	-3261.0	752.4	-8.02	-25.43	1.15
650.0	6475873	19257	164812	20961.9	-3515.3	763.7	-8.25	-25.38	1.15
660.0	6685072	-17159	172505	20878.3	-3768.3	774.7	-8.34	-25.14	1.08
670.0	6893422	-56098	180306	20792.5	-4019.7	785.5	-8.74	-25.13	1.10
680.0	7100903	-97546	188215	20704.7	-4269.7	796.0	-8.77	-24.90	1.11
690.0	7307495	-141491	196228	20614.9	-4518.3	806.3	-9.01	-24.82	0.97
700.0	7513179	-187921	204341	20523.4	-4766.3	816.0	-9.20	-24.86	0.98
710.0	7717942	-236832	212549	20429.6	-5013.1	825.7	-9.57	-24.61	0.91
720.0	7921763	-288204	220851	20333.7	-5258.4	834.8	-9.68	-24.37	1.06
730.0	8124623	-342011	229244	20235.3	-5501.5	844.1	-9.95	-24.23	0.89
740.0	8326492	-398225	237728	20135.0	-5742.7	853.2	-10.10	-24.13	0.90
750.0	8527339	-4566833	246302	20033.0	-5982.7	861.8	-10.20	-24.02	0.90
760.0	8727135	-517840	254964	19928.9	-6221.2	870.3	-10.41	-23.71	0.83
770.0	8925874	-581252	263712	19822.9	-6458.3	878.7	-10.61	-23.67	0.89

TABLE IX  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
780.0	9123569	-647040	272537	19715.1	-6694.0	886.5	-10.87	-23.61	0.71
790.0	9320200	-715144	281438	19605.2	-6928.0	894.3	-10.92	-23.37	0.73
800.0	9515691	-785560	290419	19493.6	-7160.9	901.7	-11.15	-23.24	0.67
810.0	9710029	-858344	299476	19379.9	-7392.2	908.9	-11.35	-23.02	0.77
820.0	9903275	-933439	308597	19264.4	-7622.3	915.8	-11.79	-23.07	0.58
830.0	10095343	-1010767	317788	19147.1	-7850.7	922.5	-11.87	-22.79	0.62
840.0	10286185	-1090435	327049	19027.9	-8077.8	928.9	-11.82	-22.52	0.66
S-IVB/CSM SEPARATION									
844.950	10380241	-1130713	331653	18968.2	-8189.7	932.0	-12.12	-22.69	0.53

**TABLE X**  
SPACE-FIXED EPHemeris POSITIONs, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
<b>GUIDANCE REFERENCE RELEASE</b>									
-5.038	2267.432	-2007.301	1634.712	889.4	1004.6	0.0	-0.09	0.05	0.00
0.0	2268.169	-2006.468	1634.712	889.0	1005.0	0.0	-0.09	0.05	0.00
<b>FIRST MOTION</b>									
0.110	2268.185	-2006.450	1634.712	889.0	1005.0	0.0	30.32	-4.27	3.49
<b>LIFTOFF SIGNAL</b>									
0.370	2268.223	-2006.407	1634.712	889.9	1003.9	0.9	30.59	-4.20	3.45
1.0	2268.316	-2006.303	1634.712	892.4	1001.3	3.1	4.15	-4.09	3.39
2.0	2268.463	-2006.138	1634.713	896.8	997.2	6.4	4.73	-4.06	3.37
3.0	2268.611	-2005.975	1634.714	901.8	993.2	9.8	5.07	-4.14	3.42
4.0	2268.760	-2005.812	1634.716	906.9	989.0	13.3	5.23	-4.30	3.51
5.0	2268.910	-2005.649	1634.719	912.2	984.6	16.8	5.31	-4.48	3.63
6.0	2269.060	-2005.487	1634.722	917.6	980.0	20.5	5.35	-4.68	3.76
7.0	2269.212	-2005.327	1634.726	923.0	975.3	24.4	5.40	-4.86	3.89
8.0	2269.364	-2005.167	1634.730	928.4	970.3	28.3	5.46	-5.03	4.02
9.0	2269.517	-2005.007	1634.735	933.9	965.2	32.4	5.57	-5.17	4.13
10.0	2269.671	-2004.849	1634.741	939.6	960.0	36.6	5.73	-5.28	4.24
11.0	2269.827	-2004.691	1634.747	945.4	954.7	40.9	5.93	-5.37	4.34
12.0	2269.983	-2004.535	1634.754	951.5	949.3	45.3	6.18	-5.44	4.43
13.0	2270.140	-2004.379	1634.762	957.8	943.9	49.7	6.46	-5.49	4.51
14.0	2270.298	-2004.224	1634.770	964.5	938.4	54.3	6.77	-5.53	4.59
15.0	2270.457	-2004.070	1634.780	971.4	932.9	58.9	7.09	-5.57	4.67
16.0	2270.618	-2003.917	1634.790	978.7	927.3	63.6	7.42	-5.61	4.75
17.0	2270.779	-2003.765	1634.801	986.3	921.7	68.4	7.75	-5.66	4.84
18.0	2270.942	-2003.613	1634.812	994.2	916.0	73.3	8.08	-5.71	4.93
19.0	2271.106	-2003.463	1634.825	1002.4	910.3	78.3	8.39	-5.76	5.02
20.0	2271.272	-2003.314	1634.838	1011.0	904.5	83.4	8.69	-5.81	5.13
21.0	2271.439	-2003.166	1634.852	1019.8	898.7	88.5	8.98	-5.86	5.23
22.0	2271.608	-2003.018	1634.867	1029.0	892.8	93.8	9.26	-5.90	5.34
23.0	2271.778	-2002.872	1634.883	1038.4	886.9	99.2	9.55	-5.92	5.45
24.0	2271.950	-2002.726	1634.900	1048.1	881.0	104.7	9.84	-5.93	5.55
25.0	2272.123	-2002.582	1634.918	1058.1	875.1	110.3	10.16	-5.90	5.65
26.0	2272.298	-2002.438	1634.936	1068.4	869.3	116.0	10.51	-5.84	5.73
27.0	2272.475	-2002.296	1634.956	1079.2	863.5	121.8	10.89	-5.73	5.80
28.0	2272.653	-2002.154	1634.976	1090.3	857.9	127.6	11.33	-5.58	5.85

TABLE X  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DDXSP FT/S	DZSP FT/S	DDZSP FT/S	DDYSP FT/S
29.0	2272.833	-2002.013	1634.998	1101.8	852.4	133.5	11.81	-5.38	5.88
30.0	2273.016	-2001.873	1635.020	1113.9	847.2	139.4	12.35	-5.14	5.89
31.0	2273.200	-2001.734	1635.044	1126.6	842.2	145.2	12.93	-4.88	5.88
32.0	2273.387	-2001.596	1635.068	1139.8	837.4	151.1	13.55	-4.61	5.86
33.0	2273.575	-2001.459	1635.093	1153.7	833.0	157.0	14.16	-4.37	5.82
34.0	2273.766	-2001.322	1635.120	1168.2	828.7	162.8	14.74	-4.19	5.80
35.0	2273.960	-2001.186	1635.147	1183.0	824.3	168.9	14.63	-4.58	5.85
36.0	2274.156	-2001.050	1635.175	1197.9	819.7	174.5	15.31	-4.68	5.77
37.0	2274.354	-2000.916	1635.204	1213.6	815.4	180.4	15.83	-4.22	5.68
38.0	2274.556	-2000.782	1635.235	1229.5	811.0	185.9	16.30	-4.10	5.81
39.0	2274.759	-2000.649	1635.266	1246.3	807.6	192.1	17.14	-3.39	6.27
40.0	2274.966	-2000.516	1635.298	1263.8	804.0	198.3	17.39	-3.24	6.03
41.0	2275.175	-2000.384	1635.331	1281.2	801.2	204.4	17.80	-3.44	6.20
42.0	2275.387	-2000.253	1635.365	1299.3	797.3	210.6	18.27	-3.33	6.20
43.0	2275.603	-2000.122	1635.400	1318.0	794.7	216.9	18.76	-3.10	5.94
44.0	2275.821	-1999.991	1635.436	1336.9	791.3	222.6	19.45	-2.82	5.88
45.0	2276.043	-1999.861	1635.474	1356.8	788.9	228.7	19.88	-2.68	6.16
46.0	2276.268	-1999.732	1635.512	1376.8	786.0	234.9	20.48	-2.15	6.11
47.0	2276.496	-1999.602	1635.551	1397.7	784.3	240.9	21.08	-2.24	5.90
48.0	2276.728	-1999.474	1635.591	1419.0	781.9	246.8	21.59	-1.88	5.91
49.0	2276.963	-1999.345	1635.632	1440.9	780.1	252.6	21.95	-2.17	5.65
50.0	2277.202	-1999.217	1635.674	1463.0	778.0	258.2	22.45	-1.75	5.64
51.0	2277.445	-1999.089	1635.717	1485.7	776.0	263.8	22.85	-2.31	5.69
52.0	2277.691	-1998.961	1635.761	1508.8	773.7	269.8	23.19	-1.93	6.18
53.0	2277.941	-1998.834	1635.806	1532.3	772.3	276.1	23.66	-1.41	6.35
54.0	2278.196	-1998.707	1635.852	1556.1	770.9	282.4	24.34	-1.14	6.24
55.0	2278.454	-1998.580	1635.899	1580.9	770.3	288.5	25.27	-0.34	5.89
56.0	2278.716	-1998.454	1635.947	1606.1	769.8	294.4	25.62	-0.17	6.02
57.0	2278.983	-1998.327	1635.996	1631.7	769.4	300.7	26.01	0.03	6.25
58.0	2279.253	-1998.200	1636.046	1657.9	769.4	307.1	26.68	0.27	6.45
59.0	2279.528	-1998.074	1636.097	1684.7	769.5	313.6	27.20	0.46	6.49
60.0	2279.808	-1997.947	1636.149	1712.0	769.9	320.4	27.65	0.71	6.59
61.0	2280.092	-1997.821	1636.202	1739.7	770.8	327.0	28.06	0.97	6.33
62.0	2280.381	-1997.694	1636.256	1768.0	771.6	333.1	28.55	1.13	5.76
63.0	2280.674	-1997.567	1636.311	1796.7	772.8	338.7	28.89	1.16	5.32
64.0	2280.972	-1997.439	1636.367	1825.7	773.9	343.9	29.04	1.38	5.23
65.0	2281.275	-1997.312	1636.424	1854.7	775.5	349.2	29.14	1.91	5.17
MACH @NE									
65.500	2281.428	-1997.248	1636.453	1869.4	776.5	351.8	29.23	2.15	5.13
66.0	2281.582	-1997.184	1636.482	1884.0	777.7	354.4	29.32	2.39	5.09
67.0	2281.895	-1997.056	1636.541	1913.4	780.4	359.5	29.60	2.81	4.86

TABLE X  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S	DDYSP FT/S	DDZSP FT/S
									SQ
68.0	2282.212	-1996.927	1636.600	1943.2	783.5	364.2	29.98	3.08	4.51
69.0	2282.535	-1996.798	1636.661	1973.4	786.8	368.6	30.54	3.18	4.54
70.0	2282.862	-1996.668	1636.722	2004.3	790.2	373.3	31.19	3.22	4.85
71.0	2283.194	-1996.538	1636.783	2035.9	793.6	378.4	32.00	3.38	5.00
72.0	2283.532	-1996.407	1636.846	2068.6	797.3	383.5	33.06	3.66	4.83
73.0	2283.875	-1996.275	1636.909	2102.3	801.4	388.2	33.99	3.98	4.53
74.0	2284.224	-1996.143	1636.974	2136.9	805.8	392.6	34.68	4.39	4.28
75.0	2284.579	-1996.010	1637.038	2172.2	810.8	396.7	35.49	5.15	4.40
MAXIMUM DYNAMIC PRESSURE									
76.000	2284.939	-1995.876	1637.104	2208.4	816.6	401.4	36.42	6.21	5.02
77.0	2285.306	-1995.741	1637.170	2245.4	823.9	406.8	37.19	7.28	5.91
78.0	2285.678	-1995.605	1637.238	2283.3	832.1	413.2	37.93	7.87	6.49
79.0	2286.057	-1995.467	1637.306	2322.0	840.6	419.9	38.67	8.01	6.66
80.0	2286.443	-1995.328	1637.376	2361.3	849.1	426.8	39.52	8.07	6.64
81.0	2286.835	-1995.188	1637.447	2401.3	857.4	433.1	40.57	8.71	6.73
82.0	2287.233	-1995.046	1637.519	2442.7	866.5	439.9	41.95	9.45	6.11
83.0	2287.639	-1994.903	1637.591	2485.2	875.6	444.7	43.15	8.37	3.62
84.0	2288.051	-1994.758	1637.665	2529.1	883.7	447.2	44.27	8.33	2.04
85.0	2288.471	-1994.612	1637.739	2573.8	891.9	448.5	45.57	7.44	-0.01
86.0	2288.899	-1994.465	1637.812	2620.3	899.0	447.4	46.85	7.44	-1.43
87.0	2289.334	-1994.316	1637.886	2667.2	906.3	446.3	47.04	6.97	-0.24
88.0	2289.777	-1994.166	1637.959	2714.5	913.4	447.0	47.57	7.74	1.80
89.0	2290.227	-1994.015	1638.033	2762.3	922.4	450.1	47.91	10.12	3.71
90.0	2290.686	-1993.863	1638.108	2810.6	933.5	453.7	48.82	11.97	3.61
91.0	2291.153	-1993.708	1638.182	2860.1	946.3	456.8	50.43	13.89	2.37
92.0	2291.628	-1993.551	1638.258	2911.3	960.9	458.6	51.45	14.18	1.35
93.0	2292.111	-1993.392	1638.333	2963.1	974.8	459.5	52.37	14.95	1.16
94.0	2292.603	-1993.230	1638.409	3015.9	990.9	461.0	53.43	16.23	0.98
95.0	2293.104	-1993.066	1638.485	3070.0	1007.4	461.5	54.61	17.53	0.27
96.0	2293.614	-1992.898	1638.561	3125.0	1025.6	461.7	55.73	18.05	-0.73
97.0	2294.133	-1992.728	1638.637	3181.5	1043.7	460.1	56.96	18.75	-1.29
98.0	2294.661	-1992.555	1638.713	3238.7	1062.9	459.5	57.47	19.40	-0.53
99.0	2295.199	-1992.378	1638.788	3296.6	1082.8	458.9	58.44	20.44	-0.78
100.0	2295.747	-1992.197	1638.861	3355.5	1103.5	458.0	59.41	20.63	-0.76
101.0	2296.304	-1992.014	1638.936	3415.3	1124.5	457.2	60.26	21.24	-0.71
102.0	2296.871	-1991.827	1639.012	3476.1	1146.1	456.4	61.14	21.88	-0.74
103.0	2297.448	-1991.637	1639.087	3537.7	1168.3	455.6	62.07	22.54	-0.85
104.0	2298.036	-1991.443	1639.162	3600.3	1191.1	454.7	63.01	23.21	-0.97
105.0	2298.633	-1991.245	1639.237	3663.8	1214.7	453.7	63.94	23.88	-1.06
106.0	2299.242	-1991.043	1639.311	3728.2	1238.9	452.7	64.88	24.57	-1.16
107.0	2299.861	-1990.837	1639.386	3793.5	1263.9	451.5	65.84	25.27	-1.27

TABLE X  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S	DDYSP FT/S	DDZSP FT/S
108.0	2300.491	-1990.627	1639.460	3859.8	1289.6	450.1	66.77	26.02	-1.39
109.0	2301.131	-1990.413	1639.534	3927.1	1316.0	448.6	67.70	26.82	-1.56
110.0	2301.783	-1990.194	1639.608	3995.3	1343.2	446.9	68.65	27.64	-1.78
111.0	2302.447	-1989.971	1639.681	4064.4	1377.2	445.0	69.60	28.42	-2.04
112.0	2303.122	-1989.743	1639.754	4134.5	1400.1	442.8	70.58	29.20	-2.33
113.0	2303.808	-1989.510	1639.827	4205.6	1429.6	440.3	71.62	29.94	-2.73
114.0	2304.506	-1989.272	1639.899	4277.8	1460.0	437.4	72.66	30.67	-3.07
115.0	2305.216	-1989.029	1639.971	4351.0	1491.1	434.2	73.63	31.47	-3.26
116.0	2305.938	-1988.781	1640.042	4425.0	1523.0	431.0	74.58	32.29	-3.36
117.0	2306.673	-1988.528	1640.113	4500.1	1555.7	427.6	75.54	33.15	-3.48
118.0	2307.420	-1988.269	1640.183	4576.1	1589.3	424.0	76.52	34.00	-3.60
119.0	2308.179	-1988.005	1640.253	4653.2	1623.7	420.2	77.52	34.84	-3.90
120.0	2308.952	-1987.735	1640.321	4731.3	1659.0	416.1	78.55	35.66	-4.22
121.0	2309.737	-1987.459	1640.390	4810.4	1695.0	411.6	79.62	36.46	-4.60
122.0	2310.535	-1987.177	1640.457	4890.6	1731.9	406.8	80.74	37.25	-5.00
123.0	2311.347	-1986.889	1640.524	4971.9	1769.6	401.7	81.89	38.06	-5.43
124.0	2312.172	-1986.595	1640.589	5054.3	1808.1	396.2	83.05	38.89	-5.80
125.0	2313.011	-1986.294	1640.654	5137.9	1847.5	390.3	84.14	39.78	-6.01
126.0	2313.864	-1985.986	1640.718	5222.6	1887.7	384.2	85.16	40.75	-6.11
127.0	2314.730	-1985.672	1640.781	5308.3	1929.0	377.9	86.21	41.74	-6.29
128.0	2315.611	-1985.352	1640.842	5395.0	1971.3	371.5	87.30	42.78	-6.59
129.0	2316.506	-1985.024	1640.903	5482.9	2014.6	364.7	88.39	43.86	-6.94
130.0	2317.416	-1984.688	1640.962	5571.9	2059.0	357.6	89.51	44.97	-7.35
131.0	2318.341	-1984.346	1641.021	5662.0	2104.5	350.0	90.65	46.22	-7.88
132.0	2319.280	-1983.996	1641.078	5753.3	2151.3	341.8	91.95	47.26	-8.45
133.0	2320.235	-1983.638	1641.133	5845.8	2199.2	333.2	93.05	48.52	-8.86
134.0	2321.205	-1983.272	1641.188	5939.4	2248.3	324.1	94.16	49.72	-9.37
135.0	2322.190	-1982.898	1641.240	6034.2	2298.5	314.5	95.31	50.41	-9.72
136.0	2324.191	-1982.515	1641.291	6130.4	2350.1	304.3	96.26	51.68	-10.29
137.0	2324.208	-1982.124	1641.340	6227.5	2403.1	293.5	97.24	52.88	-10.81
138.0	2325.241	-1981.724	1641.388	6325.8	2457.2	282.5	98.44	53.91	-11.15
139.0	2326.290	-1981.315	1641.433	6425.5	2512.1	271.2	99.89	54.71	-11.34
140.0	2327.356	-1980.897	1641.477	6526.7	2567.6	260.0	101.57	55.31	-11.35
141.0	2328.439	-1980.470	1641.519	6629.1	2623.0	248.9	103.73	55.73	-11.19
INBOARD ENGINE CUTOFF									
141.460	2328.942	-1980.271	1641.538	6677.0	2648.9	243.6	104.41	55.84	-11.08

TABLE X  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S	DDYSP FT/S	DDZSP FT/S
<b>OUTBOARD ENGINE CUTOFF</b>									
146.940	2335.086	-1977.785	1641.726	6929.3	2858.7	173.1	42.49	37.45	-12.94
147.0	2335.155	-1977.757	1641.728	6931.8	2860.8	172.3	42.46	37.47	-12.95
<b>S-1B/S-IVB SEPARATION</b>									
147.740	2336.002	-1977.406	1641.748	6928.7	2878.2	161.4	-17.90	19.36	-14.66
148.0	2336.303	-1977.281	1641.755	6923.7	2883.1	157.5	-18.60	19.08	-14.61
149.0	2337.441	-1976.805	1641.780	6903.6	2901.3	142.6	-20.44	18.31	-14.55
150.0	2338.575	-1976.326	1641.802	6882.9	2919.4	127.7	-20.97	18.18	-14.59
155.0	2344.212	-1973.883	1641.878	6837.6	3027.3	56.3	-1.43	23.74	-13.87
160.0	2349.838	-1971.343	1641.896	6837.9	3148.0	-12.4	1.63	24.80	-13.87
165.0	2355.469	-1988.702	1641.858	6846.5	3271.9	-81.2	1.97	24.86	-13.83
170.0	2361.108	-1965.959	1641.764	6857.3	3395.6	-150.0	2.26	24.92	-13.80
175.0	2366.757	-1963.113	1641.613	6871.6	3520.6	-218.3	2.56	24.96	-13.79
<b>INTRODUCE GUIDANCE</b>									
176.110	2368.012	-1962.468	1641.571	6875.0	3548.5	-233.5	3.27	25.16	-13.61
180.0	2372.418	-1960.165	1641.405	6887.8	3646.1	-286.3	3.22	24.78	-13.34
185.0	2378.093	-1957.115	1641.142	6907.1	3764.5	-350.2	4.00	22.61	-12.13
190.0	2383.786	-1952.971	1640.830	6929.4	3873.6	-408.1	4.62	21.05	-11.17
195.0	2389.498	-1950.741	1640.471	6953.0	3978.7	-463.3	4.86	21.20	-11.12
200.0	2395.230	-1947.423	1640.067	6978.1	4085.2	-519.7	5.25	21.37	-11.29
205.0	2400.983	-1944.017	1639.616	7004.3	4193.4	-576.1	5.34	21.68	-11.52
210.0	2406.757	-1940.521	1639.118	7031.6	4302.5	-634.5	5.65	21.80	-11.88
215.0	2412.555	-1936.936	1638.571	7060.1	4412.3	-694.7	5.76	22.02	-12.15
220.0	2418.378	-1933.259	1637.975	7090.3	4523.2	-755.7	6.01	22.19	-12.24
225.0	2424.225	-1929.491	1637.328	7121.6	4634.8	-816.9	6.25	22.44	-12.27
230.0	2430.098	-1925.631	1636.630	7154.0	4747.4	-878.6	6.54	22.66	-12.28
235.0	2435.99	-1921.678	1635.882	7187.3	4860.9	-940.5	6.69	22.85	-12.37
240.0	2441.928	-1917.631	1635.082	7222.0	4975.4	-1002.7	7.18	22.91	-12.44
245.0	2447.885	-1913.489	1634.231	7257.6	5090.8	-1065.2	7.37	23.13	-12.53
250.0	2453.873	-1909.252	1633.329	7295.1	5207.1	-1128.0	7.70	23.43	-12.63
255.0	2459.892	-1904.919	1632.375	7333.7	5324.7	-1191.2	7.94	23.56	-12.74
260.0	2465.943	-1900.489	1631.369	7373.9	5442.9	-1254.7	8.08	23.86	-12.77
265.0	2472.028	-1895.961	1630.310	7415.1	5562.4	-1318.5	8.23	24.05	-12.79
270.0	2478.147	-1891.334	1629.199	7456.8	5682.9	-1382.7	8.11	24.08	-12.87
275.0	2484.300	-1886.608	1628.034	7497.7	5803.7	-1447.5	7.86	24.21	-12.96

TABLE X  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S		DYSP FT/S		DDXSP FT/S		DDYSP FT/S		DDZSP FT/S	
				FT	S	FT	S	FT	S	FT	S	FT	S
280.0	2490.486	-1881.782	1626.816	7536.0		5924.1		-1512.6		7.09		23.64	-12.96
285.0	2496.701	-1876.860	1625.545	7570.3		6039.6		-1576.1		6.67		22.95	-12.75
290.0	2502.945	-1871.842	1624.222	7603.9		6155.6		-1639.9		6.57		23.25	-12.80
295.0	2509.215	-1866.729	1622.846	7636.4		6272.7		-1704.4		6.77		23.46	-13.03
300.0	2515.512	-1861.518	1621.417	7667.5		6390.5		-1769.5		5.89		23.57	-12.99
305.0	2521.834	-1856.211	1619.934	7697.2		6507.7		-1834.9		5.90		23.47	-13.05
310.0	2528.181	-1850.808	1618.397	7727.4		6624.5		-1894.9		6.15		23.13	-13.01
315.0	2534.553	-1845.309	1616.807	7760.7		6740.2		-1963.9		7.08		23.16	-12.70
320.0	2540.954	-1839.715	1615.165	7798.2		6856.1		-2027.3		8.42		23.37	-12.73
325.0	2547.389	-1834.025	1613.471	7840.6		6973.7		-2090.4		8.78		23.73	-12.59
330.0	2553.860	-1829.237	1611.725	7887.3		7093.6		-2158.2		9.62		24.19	-12.82
335.0	2560.370	-1822.350	1609.926	7936.8		7216.6		-2218.7		10.30		24.75	-13.00
340.0	2566.923	-1816.360	1608.073	7990.3		7342.8		-2284.2		11.02		25.54	-13.17
345.0	2573.521	-1810.264	1606.166	8045.9		7471.9		-2350.7		11.14		26.12	-13.34
350.0	2580.165	-1804.062	1604.204	8102.4		7602.9		-2417.9		11.37		26.32	-13.52
355.0	2586.856	-1799.751	1602.187	8158.7		7734.8		-2485.8		11.17		26.62	-13.69
360.0	2593.592	-1791.332	1600.113	8214.2		7867.5		-2553.1		11.34		26.65	-13.71
365.0	2600.375	-1784.803	1597.983	8270.8		8000.6		-2622.7		11.47		26.63	-13.73
370.0	2607.205	-1778.164	1595.796	8329.1		8134.9		-2691.7		11.99		27.09	-13.81
375.0	2614.084	-1771.414	1593.553	8388.8		8270.5		-2761.0		11.97		27.33	-13.81
380.0	2621.012	-1764.552	1591.252	8450.5		8407.3		-2830.6		12.46		27.54	-14.00
385.0	2627.992	-1757.577	1588.894	8513.4		8545.4		-2900.9		12.90		27.66	-14.03
390.0	2635.024	-1750.488	1586.478	8578.0		8684.8		-2971.7		12.86		28.11	-14.26
395.0	2642.110	-1743.284	1584.003	8643.3		8825.2		-3042.9		13.20		28.30	-14.34
400.0	2649.249	-1735.963	1581.470	8709.3		8966.9		-3114.7		13.57		28.39	-14.47
405.0	2656.444	-1728.526	1578.877	8777.4		9110.2		-3187.0		13.77		28.89	-14.60
410.0	2663.696	-1720.969	1576.224	8847.1		9254.9		-3260.4		14.27		29.11	-14.62
415.0	2671.005	-1713.294	1573.512	8918.5		9401.1		-3333.0		14.73		29.47	-14.79
420.0	2678.374	-1705.497	1570.738	8991.9		9549.0		-3407.3		14.95		29.82	-14.83
425.0	2685.805	-1697.578	1567.904	9068.8		9699.1		-3481.8		15.66		30.26	-14.94
430.0	2693.301	-1689.534	1565.008	9149.5		9851.5		-3556.8		16.52		30.70	-15.07
435.0	2700.864	-1681.363	1562.050	9233.5		10006.3		-3632.6		17.42		31.19	-15.23
440.0	2708.498	-1673.065	1559.029	9321.3		10163.0		-3708.3		17.80		31.58	-15.14
445.0	2716.206	-1664.637	1555.946	9411.0		10220.7		-3784.5		18.00		31.47	-15.23
450.0	2723.987	-1656.079	1552.801	9502.1		10479.1		-3860.7		18.63		31.76	-15.23
455.0	2731.844	-1647.390	1549.592	9593.5		10638.2		-3937.0		18.37		32.03	-15.35
460.0	2739.776	-1638.570	1546.321	9683.8		10797.5		-4013.8		17.95		31.89	-15.36
465.0	2747.782	-1629.619	1542.986	9774.7		10959.1		-4091.9		18.57		32.65	-15.80
470.0	2755.863	-1620.534	1539.586	9864.7		11122.7		-4171.6		17.99		33.00	-16.20
475.0	2764.018	-1611.312	1536.120	9954.7		11289.7		-4253.3		18.12		33.76	-16.50
480.0	2772.247	-1601.952	1532.586	10046.3		11460.8		-4337.1		18.37		34.69	-16.96
485.0	2780.552	-1592.449	1528.982	10140.0		11636.6		-4423.3		18.86		35.51	-17.53
490.0	2788.936	-1582.799	1525.306	10237.4		11816.4		-4511.1		19.65		36.06	-17.70
495.0	2797.402	-1573.001	1521.557	10339.3		11999.2		-4599.7		20.90		37.08	-17.71

TABLE X  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM		YSP NM		ZSP NM		DXSP FT/S		DYSP FT/S		DZSP FT/S		DDXSP FT/S		DDYSP FT/S		DDZSP FT/S		
	X	Y	Z	P	N	M													
500.0	2805.954	-1563.050	1517.736	10447.0	12184.6	-4688.3	22.07	37.10	-17.60	36.95	-17.48	36.95	-17.11	36.95	-16.92	37.07	-16.79	38.72	-16.89
505.0	2814.597	-1552.947	1513.841	10559.8	12370.3	-4776.1	22.70	29.26	29.26	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	38.75	-16.42
510.0	2823.315	-1542.692	1509.876	10677.1	12555.4	-4862.6	23.66	25.17	25.17	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	-15.47
515.0	2832.170	-1532.284	1505.839	10798.7	12739.8	-4947.4	25.17	25.17	25.17	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	-15.47
520.0	2841.110	-1521.724	1501.733	10929.7	12927.1	-5031.8	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	-15.47
525.0	2850.161	-1511.008	1497.558	11071.8	13119.1	-5116.6	29.26	29.26	29.26	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	-15.47
530.0	2859.334	-1500.132	1493.313	11224.4	13313.2	-5200.3	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	-15.47
535.0	2868.638	-1489.097	1489.000	11388.8	13505.0	-5280.3	34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.18	-15.47
540.0	2878.081	-1477.907	1484.624	11564.3	13690.6	-5353.3	36.10	36.10	36.10	36.10	36.10	36.10	36.10	36.10	36.10	36.10	36.10	-13.87	
545.0	2887.672	-1466.567	1480.191	11748.9	13868.5	-5420.2	37.36	37.36	37.36	37.36	37.36	37.36	37.36	37.36	37.36	37.36	37.36	-12.92	
550.0	2897.418	-1455.083	1475.705	11940.1	14042.4	-5483.3	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	-12.53	
555.0	2907.324	-1443.455	1471.166	12135.3	14219.7	-5547.8	39.61	39.61	39.61	39.61	39.61	39.61	39.61	39.61	39.61	39.61	39.61	-13.35	
560.0	2917.391	-1431.676	1466.572	12334.4	14410.7	-5619.1	39.54	39.54	39.54	39.54	39.54	39.54	39.54	39.54	39.54	39.54	39.54	-15.21	
565.0	2927.622	-1419.733	1461.915	12533.1	14619.8	-5701.7	39.63	39.63	39.63	39.63	39.63	39.63	39.63	39.63	39.63	39.63	39.63	-18.29	
570.0	2938.015	-1407.608	1457.183	12726.0	14854.5	-5800.6	37.91	37.91	37.91	37.91	37.91	37.91	37.91	37.91	37.91	37.91	37.91	-21.47	
575.0	2948.562	-1395.279	1452.363	12910.7	15113.9	-5916.2	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	-24.29	
580.0	2959.263	-1382.733	1447.446	13101.7	15379.9	-6034.9	39.64	39.64	39.64	39.64	39.64	39.64	39.64	39.64	39.64	39.64	39.64	-22.99	
585.0	2970.128	-1369.971	1442.433	13308.0	15641.9	-6148.0	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	-22.33	
590.0	2981.170	-1356.993	1437.330	13525.6	15904.6	-6259.2	44.98	44.98	44.98	44.98	44.98	44.98	44.98	44.98	44.98	44.98	44.98	-22.26	
595.0	2992.394	-1343.793	1432.132	13756.0	16172.3	-6370.7	47.12	47.12	47.12	47.12	47.12	47.12	47.12	47.12	47.12	47.12	47.12	-22.38	
600.0	3003.812	-1330.374	1426.843	13995.0	16445.0	-6483.5	48.79	48.79	48.79	48.79	48.79	48.79	48.79	48.79	48.79	48.79	48.79	-22.55	
 <b>S-IVB CUTOFF</b>																			
602.860	3010.432	-1322.596	1423.776	14136.2	16602.6	-6548.3	49.75	49.75	49.75	49.75	49.75	49.75	49.75	49.75	49.75	49.75	49.75	-22.67	
605.0	3015.408	-1316.740	1421.465	14104.4	16638.7	-6576.4	24.97	24.97	24.97	24.97	24.97	24.97	24.97	24.97	24.97	24.97	24.97	-11.80	
610.0	3026.963	-1303.026	1416.029	13979.4	16692.9	-6635.3	25.03	25.03	25.03	25.03	25.03	25.03	25.03	25.03	25.03	25.03	25.03	-11.74	
620.0	3049.768	-1275.463	1405.013	13728.9	16799.0	-6752.2	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10	-11.60	
630.0	3072.157	-1247.730	1393.806	13477.6	16902.6	-6867.2	25.16	25.16	25.16	25.16	25.16	25.16	25.16	25.16	25.16	25.16	25.16	-11.48	
640.0	3094.131	-1219.829	1382.410	13225.4	17003.5	-6981.1	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	-11.29	
650.0	3115.689	-1191.764	1370.828	12972.5	17101.7	-7093.6	25.34	25.34	25.34	25.34	25.34	25.34	25.34	25.34	25.34	25.34	25.34	-11.22	
660.0	3136.830	-1163.540	1359.062	12718.7	17197.4	-7204.7	25.28	25.28	25.28	25.28	25.28	25.28	25.28	25.28	25.28	25.28	25.28	-11.03	
670.0	3157.553	-1135.161	1347.114	12464.3	17290.2	-7314.4	25.56	25.56	25.56	25.56	25.56	25.56	25.56	25.56	25.56	25.56	25.56	-10.94	
680.0	3177.856	-1106.631	1334.987	12209.1	17380.6	-7422.8	25.84	25.84	25.84	25.84	25.84	25.84	25.84	25.84	25.84	25.84	25.84	-10.84	
690.0	3197.738	-1077.954	1322.683	11953.4	17468.3	-7529.7	25.59	25.59	25.59	25.59	25.59	25.59	25.59	25.59	25.59	25.59	25.59	-10.62	
700.0	3217.197	-1049.135	1310.203	11696.5	17554.3	-7635.6	25.77	25.77	25.77	25.77	25.77	25.77	25.77	25.77	25.77	25.77	25.77	-10.61	
710.0	3236.233	-1020.174	1297.549	11438.8	17637.7	-7740.3	25.89	25.89	25.89	25.89	25.89	25.89	25.89	25.89	25.89	25.89	25.89	-10.35	
720.0	3254.845	-991.078	1284.724	11180.2	17718.4	-7843.4	25.78	25.78	25.78	25.78	25.78	25.78	25.78	25.78	25.78	25.78	25.78	-10.34	
730.0	3273.033	-961.851	1271.731	10921.3	17795.7	-7945.0	25.92	25.92	25.92	25.92	25.92	25.92	25.92	25.92	25.92	25.92	25.92	-10.06	
740.0	3290.797	-932.500	1258.573	10662.3	17870.2	-8045.0	25.97	25.97	25.97	25.97	25.97	25.97	25.97	25.97	25.97	25.97	25.97	-9.99	
750.0	3308.134	-903.031	1245.253	10402.5	17942.6	-8143.8	25.98	25.98	25.98	25.98	25.98	25.98	25.98	25.98	25.98	25.98	25.98	-9.91	
760.0	3325.041	-873.447	1231.771	10142.4	18012.3	-8241.2	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	-9.66	
770.0	3341.514	-843.748	1218.128	9881.6	18079.4	-8337.4	26.05	26.05	26.05	26.05	26.05	26.05	26.05	26.05	26.05	26.05	26.05	-9.64	

TABLE X  
SPACE-FIXED EPHemeris POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S	DDYSP FT/S	DDZSP FT/S
780.0	3357.560	-813.937	1204.326	9620.3	18144.2	-8432.1	-26.24	6.44	-9.41
790.0	3373.181	-784.021	1190.371	9358.5	18206.2	-8525.4	-26.12	6.21	-9.30
800.0	3388.370	-754.011	1176.267	9096.2	18266.0	-8617.6	-26.21	5.96	-9.13
810.0	3403.119	-723.904	1162.009	8833.3	18323.2	-8708.3	-26.20	5.60	-9.06
820.0	3417.440	-693.698	1147.601	8569.9	18377.9	-8797.7	-26.18	5.37	-8.83
830.0	3431.333	-663.411	1133.052	8306.2	18430.2	-8885.8	-26.44	5.09	-8.71
840.0	3444.779	-633.040	1118.355	8042.0	18480.0	-8972.6	-26.22	4.90	-8.63
S-IVB/CSM SEPARATION									
844.950	3451.277	-617.972	1111.026	7911.1	18503.7	-9015.0	-26.58	4.82	-8.52

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
GUIDANCE REFERENCE RELEASE											
-5.038	3441.335	-80.5611	28.3608	0.00	90.00	0.0	90.00	-0.00	1341.8	0.000	105
0.0	3441.335	-80.5611	28.3608	0.00	90.00	0.0	90.00	-0.00	1341.8	0.000	105
FIRST MOTION											
0.110	3441.335	-80.5611	28.3608	0.00	90.00	0.0	90.00	0.00	1341.8	0.000	105
LIFTOFF SIGNAL											
0.370	3441.335	-80.5611	28.3608	297.36	81.47	1.7	90.00	0.07	1341.5	0.000	105
1.0	3441.336	-80.5611	28.3608	298.03	84.01	5.9	89.99	0.25	1341.2	0.000	108
2.0	3441.337	-80.5611	28.3608	299.33	86.88	12.9	89.99	0.55	1341.2	0.000	117
3.0	3441.340	-80.5611	28.3608	300.96	88.66	20.2	89.99	0.86	1341.5	0.000	134
4.0	3441.344	-80.5611	28.3608	302.04	89.69	27.8	90.00	1.19	1341.9	0.000	157
5.0	3441.349	-80.5611	28.3608	131.35	89.79	35.6	90.00	1.52	1342.3	0.000	189
6.0	3441.356	-80.5611	28.3608	136.07	89.60	43.7	90.01	1.86	1342.7	0.000	229
7.0	3441.364	-80.5611	28.3608	146.42	89.59	51.9	90.01	2.21	1343.0	0.000	277
8.0	3441.373	-80.5611	28.3608	163.89	89.64	60.3	90.02	2.57	1343.2	0.000	332
9.0	3441.383	-80.5611	28.3608	187.78	89.67	68.9	90.02	2.94	1343.5	0.000	397
10.0	3441.396	-80.5611	28.3608	208.64	89.66	77.8	90.02	3.32	1343.8	0.000	471
11.0	3441.409	-80.5611	28.3608	219.22	89.64	86.8	90.02	3.70	1344.3	0.000	553
12.0	3441.424	-80.5611	28.3608	219.31	89.64	96.2	90.02	4.10	1344.9	0.001	644
13.0	3441.441	-80.5611	28.3608	207.87	89.66	105.7	90.02	4.51	1345.7	0.001	745
14.0	3441.459	-80.5612	28.3608	183.27	89.66	115.5	90.03	4.92	1346.7	0.001	856
15.0	3441.479	-80.5612	28.3608	155.72	89.57	125.6	90.04	5.35	1348.1	0.001	976
16.0	3441.500	-80.5611	28.3608	137.84	89.37	136.0	90.05	5.78	1349.7	0.001	1107
17.0	3441.524	-80.5611	28.3608	128.02	89.11	146.7	90.06	6.23	1351.6	0.001	1248
18.0	3441.549	-80.5611	28.3608	122.38	88.80	157.6	90.08	6.68	1353.8	0.002	1400
19.0	3441.575	-80.5611	28.3608	118.84	88.48	168.8	90.09	7.15	1356.3	0.002	1564
20.0	3441.604	-80.5611	28.3608	116.41	88.14	180.4	90.11	7.62	1359.1	0.003	1738
21.0	3441.635	-80.5611	28.3608	114.61	87.80	192.2	90.13	8.11	1362.2	0.004	1924
22.0	3441.667	-80.5611	28.3608	113.17	87.46	204.3	90.15	8.60	1365.6	0.005	2122
23.0	3441.702	-80.5610	28.3607	111.94	87.12	216.7	90.17	9.09	1369.2	0.007	2332
24.0	3441.739	-80.5610	28.3607	110.84	86.78	229.3	90.19	9.60	1373.2	0.009	2555
25.0	3441.777	-80.5610	28.3607	109.84	86.42	242.2	90.22	10.11	1377.5	0.011	2790
26.0	3441.818	-80.5609	28.3607	108.90	86.06	255.4	90.24	10.62	1382.3	0.014	3038
27.0	3441.861	-80.5609	28.3607	108.02	85.66	268.8	90.26	11.14	1387.5	0.017	3299
28.0	3441.906	-80.5608	28.3607	107.20	85.23	282.5	90.29	11.66	1393.2	0.020	3574

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	FLT-PATH DEG	HEAD DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
29.0	3441.954	-80.5607	28.3606	106.47	86.77	296.4	90.32	12.18	1399.4	0.024	3863
30.0	3442.004	-80.5606	28.3606	105.83	84.25	310.7	90.35	12.70	1406.4	0.029	4165
31.0	3442.056	-80.5605	28.3606	105.30	83.68	325.2	90.39	13.21	1414.0	0.035	4481
32.0	3442.110	-80.5604	28.3606	104.87	83.07	340.1	90.44	13.73	1422.4	0.041	4812
33.0	3442.167	-80.5603	28.3605	104.55	82.41	355.4	90.49	14.24	1431.6	0.048	5157
34.0	3442.226	-80.5601	28.3605	104.33	81.72	371.0	90.54	14.76	1441.5	0.056	5516
35.0	3442.288	-80.5600	28.3604	104.04	81.08	387.2	90.60	15.28	1451.8	0.066	5891
36.0	3442.352	-80.5598	28.3604	104.30	80.50	403.3	90.67	15.79	1461.9	0.077	6280
37.0	3442.419	-80.5596	28.3603	104.27	79.87	420.1	90.74	16.30	1473.2	0.088	6687
38.0	3442.488	-80.5593	28.3603	104.59	79.26	437.0	90.83	16.81	1484.6	0.101	7108
39.0	3442.560	-80.5591	28.3602	104.23	78.58	454.5	90.89	17.31	1497.4	0.115	7545
40.0	3442.635	-80.5588	28.3602	104.08	77.91	472.6	90.96	17.81	1510.9	0.131	7999
41.0	3442.712	-80.5585	28.3601	103.81	77.22	490.4	91.02	18.28	1524.8	0.148	8469
42.0	3442.792	-80.5581	28.3600	103.83	76.64	509.4	91.11	18.79	1538.9	0.166	8956
43.0	3442.875	-80.5578	28.3599	103.63	75.95	528.3	91.18	19.25	1554.2	0.187	9460
44.0	3442.961	-80.5574	28.3598	103.81	75.35	547.6	91.28	19.73	1569.4	0.208	9981
45.0	3443.050	-80.5569	28.3597	103.71	74.67	567.5	91.37	20.19	1586.1	0.232	10519
46.0	3443.141	-80.5564	28.3596	103.71	74.07	587.8	91.46	20.65	1602.7	0.258	11076
47.0	3443.236	-80.5559	28.3595	103.63	73.38	608.5	91.55	21.09	1620.7	0.286	11650
48.0	3443.333	-80.5554	28.3594	103.71	72.76	629.7	91.66	21.53	1638.8	0.315	12242
49.0	3443.434	-80.5548	28.3593	103.74	72.11	651.4	91.77	21.96	1657.9	0.347	12852
50.0	3443.537	-80.5542	28.3592	103.87	71.51	673.2	91.89	22.38	1677.1	0.381	13481
51.0	3443.644	-80.5535	28.3591	104.01	70.92	695.6	92.02	22.79	1696.8	0.417	14129
52.0	3443.754	-80.5528	28.3588	104.11	70.38	718.7	92.14	23.22	1717.0	0.456	14796
53.0	3443.867	-80.5521	28.3587	104.05	69.82	742.0	92.24	23.62	1738.0	0.497	15483
54.0	3443.983	-80.5513	28.3585	104.01	69.27	765.7	92.34	24.02	1759.4	0.540	16189
55.0	3444.102	-80.5504	28.3583	103.98	68.68	790.0	92.45	24.49	1782.1	0.586	16915
56.0	3444.225	-80.5495	28.3581	103.98	68.10	814.6	92.57	24.75	1805.2	0.635	17760
57.0	3444.351	-80.5486	28.3579	103.93	67.54	839.7	92.67	25.11	1828.9	0.686	18426
58.0	3444.480	-80.5476	28.3576	103.86	66.99	865.4	92.77	25.46	1853.3	0.741	19212
59.0	3444.613	-80.5465	28.3574	103.77	66.45	891.7	92.88	25.80	1878.4	0.798	20019
60.0	3444.750	-80.5454	28.3572	103.67	65.92	918.7	92.97	26.13	1904.3	0.858	20846
61.0	3444.889	-80.5443	28.3569	103.58	65.38	945.8	93.07	26.44	1930.7	0.921	21695
62.0	3445.033	-80.5431	28.3566	103.56	64.85	973.3	93.18	26.75	1957.6	0.988	22565
63.0	3445.179	-80.5418	28.3564	103.60	64.31	1001.2	93.31	27.03	1985.0	1.058	23457
64.0	3445.329	-80.5404	28.3561	103.69	63.79	1029.1	93.45	27.31	2012.5	1.131	24368
65.0	3445.483	-80.5390	28.3558	103.74	63.28	1057.2	93.58	27.57	2040.4	1.207	25302
<b>MACH ONE</b>											
65.500	3445.561	-80.5383	28.3556	103.75	63.02	1071.3	93.64	27.69	2054.6	1.247	25777
66.0	3445.640	-80.5376	28.3554	103.75	62.76	1085.4	93.70	27.81	2068.8	1.287	26256
67.0	3445.801	-80.5360	28.3551	103.76	62.24	1113.7	93.82	28.02	2097.4	1.371	27231

TABLE XI  
GEODEMIC COORDINATES

TIME SEC	EC DIST NM	LONG. DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
68.0	3445.965	-80.5344	28.3547	103.79	61.72	1142.2	93.95	28.23	2126.6	1.458	28226
69.0	3446.132	-80.5328	28.3544	103.84	61.20	1171.1	94.08	28.42	2156.3	1.549	29242
70.0	3446.302	-80.5310	28.3540	103.87	60.70	1200.8	94.21	28.61	2186.5	1.644	30278
71.0	3446.476	-80.5292	28.3536	103.88	60.22	1231.3	94.33	28.81	2217.7	1.743	31335
72.0	3446.654	-80.5273	28.3532	103.90	59.74	1262.9	94.46	29.00	2249.9	1.845	32414
73.0	3446.835	-80.5254	28.3527	103.94	59.24	1295.4	94.59	29.18	2283.1	1.952	33515
74.0	3447.020	-80.5233	28.3523	104.01	58.75	1328.6	94.74	29.35	2317.3	2.063	34639
75.0	3447.209	-80.5212	28.3518	104.07	58.24	1362.5	94.89	29.51	2352.2	2.179	35786
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TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
108.0	3455.818	-80.3856	28.3200	105.28	42.43	3023.8.	99.54	29.89	4094.4	9.600	88065
109.0	3456.157	-80.3788	28.3183	105.28	42.01	3092.3	99.64	29.79	4166.0	9.971	90119
110.0	3456.500	-80.3718	28.3166	105.29	41.60	3162.0	99.75	29.69	4238.7	10.353	92202
111.0	3456.848	-80.3647	28.3149	105.29	41.19	3232.8	99.85	29.58	4312.5	10.747	94315
112.0	3457.201	-80.3573	28.3131	105.29	40.78	3304.8	99.95	29.47	4387.5	11.151	96458
113.0	3457.559	-80.3497	28.3113	105.30	40.38	3378.0	100.05	29.36	4463.8	11.567	98630
114.0	3457.921	-80.3419	28.3094	105.30	39.98	3452.5	100.15	29.24	4541.2	11.995	100832
115.0	3458.289	-80.3339	28.3074	105.31	39.59	3528.1	100.25	29.13	4619.8	12.434	103064
116.0	3458.662	-80.3257	28.3054	105.32	39.21	3605.0	100.34	29.01	4699.6	12.886	105326
117.0	3459.039	-80.3172	28.3034	105.32	38.83	3683.1	100.43	28.89	4780.6	13.350	107619
118.0	3459.422	-80.3085	28.3013	105.32	38.46	3762.4	100.52	28.76	4862.8	13.826	109942
119.0	3459.810	-80.2996	28.2991	105.32	38.09	3842.9	100.61	28.64	4946.2	14.315	112296
120.0	3460.203	-80.2905	28.2969	105.32	37.72	3924.8	100.69	28.51	5030.9	14.817	114680
121.0	3460.601	-80.2811	28.2946	105.33	37.36	4008.0	100.78	28.38	5116.9	15.332	117095
122.0	3461.004	-80.2714	28.2922	105.33	37.01	4092.4	100.86	28.25	5204.1	15.861	119541
123.0	3461.412	-80.2616	28.2898	105.34	36.66	4178.3	100.95	28.12	5292.7	16.403	122018
124.0	3461.825	-80.2514	28.2874	105.34	36.31	4265.5	101.03	27.99	5382.6	16.958	124527
125.0	3462.243	-80.2411	28.2848	105.35	35.97	4354.1	101.12	27.85	5473.9	17.528	127067
126.0	3462.667	-80.2304	28.2723	105.36	35.64	4444.1	101.20	27.72	5566.5	18.112	129638
127.0	3463.096	-80.2195	28.2796	105.37	35.30	4535.4	101.28	27.58	5660.5	18.710	132241
128.0	3463.530	-80.2083	28.2769	105.37	34.98	4628.2	101.35	27.45	5755.9	19.323	134876
129.0	3463.969	-80.1969	28.2741	105.38	34.65	4722.4	101.42	27.31	5852.7	19.951	137543
130.0	3464.414	-80.1852	28.2712	105.38	34.33	4818.0	101.50	27.17	5950.9	20.595	140242
131.0	3464.864	-80.1732	28.2683	105.38	34.01	4915.1	101.57	27.02	6050.6	21.253	142972
132.0	3465.319	-80.1609	28.2653	105.39	33.68	5013.7	101.64	26.87	6151.9	21.928	145735
133.0	3465.779	-80.1483	28.2622	105.40	33.37	5114.0	101.71	26.72	6254.7	22.618	148529
134.0	3466.245	-80.1355	28.2591	105.40	33.05	5215.6	101.78	26.57	6358.9	23.324	151355
135.0	3466.716	-80.1223	28.2559	105.41	32.73	5319.0	101.85	26.42	6464.8	24.047	154213
136.0	3467.192	-80.1088	28.2526	105.42	32.42	5424.1	101.92	26.26	6572.5	24.787	157102
137.0	3467.673	-80.0950	28.2492	105.43	32.10	5530.5	101.99	26.10	6681.5	25.544	160022
138.0	3468.159	-80.0809	28.2457	105.43	31.79	5638.6	102.05	25.94	6792.1	26.318	162974
139.0	3468.651	-80.0665	28.2422	105.44	31.49	5748.4	102.12	25.78	6904.4	27.110	165957
140.0	3469.148	-80.0518	28.2386	105.45	31.20	5859.9	102.18	25.63	7018.4	27.920	168973
141.0	3469.650	-80.0367	28.2349	105.46	30.92	5972.9	102.24	25.48	7133.6	28.747	172022
INBOARD ENGINE CUTOFF											
141.460	3469.883	-80.0297	28.2332	105.46	30.80	6025.7	102.27	25.42	7187.4	29.134	173436
142.0	3470.158	-80.0213	28.2311	105.47	30.66	6069.8	102.30	25.34	7232.6	29.593	175104
143.0	3470.668	-80.0057	28.2273	105.48	30.41	6122.8	102.34	25.17	7288.0	30.450	178199
144.0	3471.179	-79.9899	28.2234	105.49	30.17	6173.9	102.37	25.00	7341.2	31.317	181297
145.0	3471.690	-79.9740	28.2195	105.50	29.94	6224.7	102.41	24.84	7394.3	32.193	184399
146.0	3472.202	-79.9579	28.2156	105.52	29.70	6275.9	102.44	24.68	7447.5	33.078	187504

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
<b>OUTBOARD ENGINE CUTOFF</b>											
146.940	3472.683	-79.9426	28.2118	105.53	29.49	6324.2	102.48	24.53	7497.8	33.918	190426
147.0	3472.714	-79.9416	28.2116	105.53	29.48	6327.2	102.48	24.52	7500.9	33.972	190612
<b>S-IB/S-IVB SEPARATION</b>											
147.740	3473.093	-79.9294	28.2086	105.54	29.31	6329.0	102.49	24.38	7504.4	34.641	192916
148.0	3473.228	-79.9251	28.2075	105.54	29.25	6325.6	102.50	24.33	7501.6	34.880	193730
149.0	3473.734	-79.9087	28.2034	105.56	29.02	6311.4	102.51	24.13	7489.8	35.780	196803
150.0	3474.236	-79.8923	28.1996	105.57	28.79	6296.8	102.52	23.93	7477.5	36.680	199847
155.0	3476.680	-79.8103	28.1791	105.62	27.66	6286.1	102.58	22.97	7478.0	41.190	214679
160.0	3479.045	-79.7272	28.1585	105.67	26.57	6325.7	102.66	22.07	7527.8	45.761	229028
165.0	3481.339	-79.6428	28.1375	105.72	25.49	6376.8	102.73	21.20	7588.6	50.407	242943
170.0	3483.563	-79.5570	28.1160	105.77	24.43	6432.6	102.82	20.34	7653.5	55.130	256437
175.0	3485.720	-79.4698	28.0942	105.82	23.41	6494.6	102.90	19.51	7724.0	59.933	266521
<b>INTRODUCE GUIDANCE</b>											
176.110	3486.190	-79.4502	28.0893	105.83	23.18	6509.0	102.91	19.33	7740.3	61.010	272368
180.0	3487.810	-79.3811	28.0719	105.87	22.41	6561.1	102.98	18.71	7798.6	64.818	282199
185.0	3489.839	-79.2910	28.0492	105.92	21.51	6629.6	103.06	17.98	7876.1	69.785	295500
190.0	3491.814	-79.1996	28.0260	105.98	20.73	6698.7	103.14	17.36	7949.1	74.830	306478
195.0	3493.742	-79.1068	28.0024	106.03	20.01	6768.5	103.22	16.78	8024.6	79.949	318172
200.0	3495.626	-79.0127	27.9784	106.09	19.30	6841.8	103.30	16.21	8102.6	85.143	329593
205.0	3497.465	-78.9173	27.9540	106.15	18.61	6918.2	103.38	15.65	8183.9	90.415	346040
210.0	3499.259	-78.8205	27.9291	106.22	17.92	6997.6	103.47	15.09	8267.8	95.765	351616
215.0	3501.008	-78.7223	27.9037	106.30	17.24	7079.8	103.57	14.55	8354.4	101.195	362221
220.0	3502.714	-78.6227	27.8778	106.38	16.59	7165.5	103.68	14.02	8444.6	106.707	372555
225.0	3504.375	-78.5216	27.8514	106.47	15.95	7253.8	103.78	13.50	8536.1	112.302	382624
230.0	3505.994	-78.4191	27.8244	106.55	15.32	7344.8	103.88	13.00	8630.7	117.982	392431
235.0	3507.570	-78.3151	27.7970	106.64	14.72	7438.3	103.99	12.51	8727.6	123.748	401980
240.0	3509.104	-78.2096	27.7689	106.72	14.13	7534.6	104.09	12.03	8827.1	129.602	411275
245.0	3510.597	-78.1026	27.7403	106.80	13.56	7633.4	104.19	11.56	8928.8	135.544	420320
250.0	3512.051	-77.9940	27.7112	106.89	13.01	7735.4	104.30	11.12	9033.5	141.577	429119
255.0	3513.464	-77.8838	27.6814	106.97	12.48	7840.0	104.40	10.68	9140.7	147.702	437679
260.0	3514.839	-77.7721	27.6511	107.05	11.97	7947.5	104.51	10.26	9250.6	153.920	446004
265.0	3516.177	-77.6587	27.6202	107.14	11.47	8057.6	104.61	9.85	9362.9	160.233	454099
270.0	3517.477	-77.5437	27.5886	107.22	10.99	8169.5	104.71	9.46	9476.9	166.642	461967
275.0	3518.740	-77.4270	27.5564	107.30	10.52	8282.1	104.82	9.07	9591.3	173.148	469609

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
280.0	3519.965	-77.3087	27.5236	107.39	10.06	8393.2	104.92	8.69	9704.3	179.751	477021
285.0	3521.153	-77.1888	27.4902	107.47	9.62	8499.0	105.02	8.33	9811.7	186.446	484204
290.0	3522.304	-77.0674	27.4561	107.56	9.20	8605.4	105.12	7.97	9916.7	193.231	491163
295.0	3523.417	-76.9444	27.4214	107.65	8.78	8712.4	105.23	7.62	10028.3	200.107	497892
300.0	3524.492	-76.8200	27.3862	107.73	8.37	8819.8	105.33	7.27	10137.0	201.074	504391
305.0	3525.529	-76.6940	27.3502	107.82	7.96	8926.7	105.43	6.93	10245.2	214.131	510654
310.0	3526.528	-76.5665	27.3137	107.91	7.58	9034.3	105.53	6.61	10354.0	221.279	516686
315.0	3527.491	-76.4375	27.2765	108.00	7.23	9144.2	105.63	6.31	10465.0	228.517	522500
320.0	3528.422	-76.3070	27.2387	108.09	6.91	9257.9	105.74	6.04	10579.6	235.847	528119
325.0	3529.324	-76.1749	27.2002	108.17	6.61	9376.9	105.84	5.79	10699.4	243.273	533562
330.0	3530.199	-76.0411	27.1610	108.26	6.34	9501.2	105.94	5.56	10824.4	250.798	538843
335.0	3531.050	-75.9056	27.1211	108.35	6.07	9630.3	106.05	5.34	10954.2	258.426	543972
340.0	3531.877	-75.7684	27.0804	108.44	5.82	9765.0	106.15	5.13	11089.5	266.161	548956
345.0	3532.681	-75.6292	27.0390	108.52	5.58	9903.9	106.25	4.92	11229.0	274.007	553801
350.0	3533.463	-75.4882	26.9968	108.61	5.35	10045.3	106.36	4.73	11371.0	281.967	558510
355.0	3534.223	-75.3453	26.9538	108.69	5.13	10187.8	106.46	4.53	11514.0	290.041	563086
360.0	3534.962	-75.2005	26.9100	108.78	4.91	10330.7	106.56	4.35	11657.4	298.229	567528
365.0	3535.678	-75.0538	26.8653	108.86	4.70	10475.2	106.66	4.17	11802.3	306.534	571841
370.0	3536.376	-74.9051	26.8199	108.95	4.51	10622.2	106.77	4.01	11949.7	314.956	576031
375.0	3537.054	-74.7545	26.7736	109.04	4.33	10771.6	106.87	3.86	12099.4	323.996	580110
380.0	3537.716	-74.6019	26.7264	109.12	4.17	10923.6	106.97	3.72	12251.8	332.157	584083
385.0	3538.362	-74.4473	26.6784	109.21	4.02	11077.9	107.08	3.58	12406.4	349.941	587961
390.0	3538.993	-74.2907	26.6295	109.30	3.87	11234.6	107.18	3.46	12563.3	349.848	591749
395.0	3539.611	-74.1320	26.5796	109.39	3.74	11393.0	107.29	3.35	12722.0	358.881	595455
400.0	3540.217	-73.9712	26.5289	109.48	3.62	11553.3	107.40	3.24	12882.5	368.042	599086
405.0	3540.812	-73.8084	26.4771	109.57	3.51	11716.6	107.50	3.15	13045.9	377.331	602650
410.0	3541.397	-73.6434	26.4245	109.66	3.41	11882.3	107.61	3.06	13211.8	386.750	606154
415.0	3541.974	-73.4762	26.3708	109.76	3.32	12050.6	107.72	2.99	13380.3	396.303	609609
420.0	3542.545	-73.3069	26.3162	109.85	3.24	12221.8	107.83	2.92	13551.7	405.990	613024
425.0	3543.112	-73.1354	26.2605	109.94	3.18	12397.3	107.93	2.87	13727.3	415.815	616411
430.0	3543.676	-72.9615	26.2038	110.03	3.13	12577.4	108.04	2.83	13907.5	425.780	619786
435.0	3544.242	-72.8840	26.1560	110.13	3.09	12761.6	108.15	2.80	14091.7	435.890	623165
440.0	3544.810	-72.6069	26.0871	110.22	3.07	12950.0	108.26	2.79	14280.3	446.147	626564
445.0	3545.385	-72.4260	26.0271	110.31	3.07	13140.6	108.37	2.79	14470.9	456.554	630000
450.0	3545.969	-72.2426	25.9659	110.41	3.07	13332.7	108.48	2.79	14663.0	467.112	633484
455.0	3546.562	-72.0569	25.9036	110.50	3.09	13525.7	108.59	2.81	14856.2	477.822	637031
460.0	3547.167	-71.8687	25.8401	110.60	3.10	13718.6	108.70	2.83	15049.1	488.584	640645
465.0	3547.784	-71.6781	25.7754	110.70	3.12	13913.8	108.81	2.85	15244.4	499.698	644330
470.0	3548.413	-71.4851	25.7095	110.79	3.14	14110.4	108.93	2.86	15441.1	510.866	648091
475.0	3549.054	-71.2896	25.6424	110.89	3.15	14310.3	109.04	2.88	15641.1	522.190	651921
480.0	3549.707	-71.0916	25.5741	110.99	3.16	14515.0	109.15	2.90	15845.8	533.673	655825
485.0	3550.373	-70.8911	25.5045	111.09	3.18	14725.1	109.27	2.92	16056.0	545.319	659803
490.0	3551.053	-70.6879	25.4335	111.19	3.21	14941.2	109.38	2.94	16272.1	557.132	663866
495.0	3551.750	-70.4821	25.3612	111.29	3.25	15162.6	109.50	2.98	16493.6	569.117	668031

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
500.0	3552.468	-70.2735	25.2875	111.40	3.31	15389.7	109.61	3.04	16720.8	581.277	672324
505.0	3553.212	-70.0621	25.2124	111.50	3.39	15620.1	109.73	3.12	16931.2	593.616	676777
510.0	3553.989	-69.8479	25.1358	111.60	3.49	15852.6	109.85	3.22	17183.8	606.136	681426
515.0	3554.804	-67.6309	25.0578	111.70	3.62	16087.0	109.96	3.34	17418.1	618.837	686305
520.0	3555.664	-69.4110	24.9783	111.81	3.78	16329.1	110.08	3.49	17660.3	631.722	691456
525.0	3556.577	-69.1882	24.8972	111.91	3.96	16581.9	110.20	3.66	17913.0	644.798	696927
530.0	3557.551	-68.9624	24.8146	112.01	4.17	16842.4	110.32	3.86	18173.4	658.071	702757
535.0	3558.597	-68.7334	24.7303	112.12	4.43	17107.4	110.44	4.11	18438.3	671.546	709043
540.0	3559.729	-68.5014	24.6443	112.22	4.73	17372.8	110.56	4.39	18703.5	685.223	715839
545.0	3560.960	-68.2663	24.5668	112.33	5.08	17636.7	110.67	4.73	18967.1	699.098	723240
550.0	3562.303	-68.0283	24.4676	112.43	5.46	17900.7	110.79	5.08	19230.7	713.169	731319
555.0	3563.765	-67.7873	24.3767	112.54	5.84	18170.2	110.91	5.44	19499.9	727.437	740118
560.0	3565.347	-67.5432	24.2841	112.65	6.21	18454.0	111.04	5.79	19783.3	741.907	749644
565.0	3567.045	-67.2959	24.1897	112.76	6.52	18753.9	111.16	6.09	20083.0	756.591	759872
570.0	3568.847	-67.0452	24.0934	112.87	6.77	19073.2	111.28	6.33	20402.3	771.504	770736
575.0	3570.740	-66.7907	23.9951	112.98	6.95	19410.1	111.41	6.50	20739.3	786.661	782143
580.0	3572.714	-66.5324	23.8946	113.09	7.14	19756.6	111.54	6.69	21085.9	802.073	794050
585.0	3574.786	-66.2702	23.7920	113.21	7.38	20108.3	111.67	6.92	21437.6	817.745	806567
590.0	3576.971	-66.0040	23.6872	113.32	7.65	20467.1	111.80	7.18	21796.3	833.677	819725
595.0	3579.275	-65.7339	23.5801	113.44	7.94	20837.6	111.93	7.46	22166.6	849.877	833627
600.0	3581.712	-65.4597	23.4708	113.56	8.25	21217.5	112.06	7.76	22546.3	866.347	848339
S-IVB CUTOFF											
602.860	3583.169	-65.3010	23.4072	113.62	8.44	21438.8	112.14	7.94	22767.5	875.891	857135
605.0	3584.279	-65.1917	23.3592	113.68	8.43	21453.1	112.19	7.94	22782.2	883.071	863834
610.0	3586.854	-64.9037	23.2468	113.81	8.35	21431.7	112.31	7.86	22761.9	899.891	879381
620.0	3591.929	-64.3504	23.0208	114.07	8.20	21389.5	112.55	7.72	22721.8	933.277	910017
630.0	3596.897	-63.8008	22.7932	114.32	8.04	21348.1	112.78	7.57	22682.6	966.621	940006
640.0	3601.761	-62.2548	22.5641	114.57	7.89	21307.8	113.00	7.42	22644.4	999.868	969358
650.0	3606.520	-62.7123	22.3335	114.81	7.73	21268.3	113.23	7.27	22606.9	1033.022	998075
660.0	3611.174	-62.1733	22.1014	115.05	7.57	21229.8	113.45	7.11	22570.4	1066.084	1026151
670.0	3615.722	-61.6377	21.8679	115.29	7.41	21192.1	113.67	6.96	22534.7	1099.057	1053587
680.0	3620.164	-61.1054	21.6329	115.53	7.24	21155.4	113.88	6.81	22499.9	1131.943	1080380
690.0	3624.500	-60.5763	21.3966	115.76	7.08	21119.7	114.09	6.65	22466.0	1164.745	1106527
700.0	3628.729	-60.0504	21.1589	115.98	6.91	21085.3	114.29	6.50	22433.6	1197.466	1132024
710.0	3632.850	-59.5276	20.9198	116.21	6.74	21051.9	114.50	6.34	22401.9	1230.109	1156864
720.0	3636.863	-59.0079	20.6795	116.43	6.57	21019.2	114.70	6.18	22370.9	1262.677	1181052
730.0	3640.770	-58.4911	20.4378	116.64	6.41	20986.8	114.89	6.02	22340.2	1295.171	1204597
740.0	3644.573	-57.9772	20.1949	116.85	6.24	20955.3	115.09	5.86	22310.3	1327.592	1222509
750.0	3648.270	-57.4663	19.9508	117.06	6.07	20925.0	115.28	5.70	22281.6	1359.940	1249780
760.0	3651.857	-56.9582	19.7054	117.27	5.90	20895.5	115.46	5.54	22253.7	1392.218	1271387
770.0	3655.333	-56.4529	19.4589	117.47	5.73	20867.0	115.65	5.37	22226.6	1424-429	129317

TABLE XI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
780.0	3658.702	-55.9501	19.2112	117.67	5.55	20839.4	115.83	5.21	22200.5	1456.582	1312595
790.0	3661.970	-55.4500	18.9623	117.87	5.38	20812.5	116.01	5.05	22175.0	1488.674	1332261
800.0	3665.132	-54.9526	18.7123	118.06	5.21	20786.9	116.18	4.88	22150.7	1520.700	1351284
810.0	3668.177	-54.4576	18.4612	118.25	5.03	20761.8	116.35	4.72	22126.9	1552.669	1369600
820.0	3671.117	-53.9650	18.2090	118.44	4.85	20737.8	116.52	4.55	22104.1	1584.590	1387282
830.0	3673.958	-53.4748	17.9558	118.62	4.68	20714.7	116.69	4.39	22082.2	1616.452	1404357
840.0	3676.678	-52.9870	17.7015	118.80	4.50	20692.4	116.85	4.22	22061.1	1648.262	1420704
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S-IVB/CSM SEPARATION											
844.950	3677.986	-52.7464	17.5752	118.89	4.41	20681.7	116.93	4.14	22050.9	1663.994	1428563

TABLE XII

## S-1B STAGE FREE FLIGHT TRAJECTORY

## EARTH-FIXED PLUMBLINE POSITIONS

TIME SEC	EARTH-FIXED PLUMBLINE POSITIONS			EARTH-FIXED PLUMBLINE VELOCITIES			ALTITUDE M	DZ/E M/S	DYE M/S	LAT DEG	LONG DEG
	XE M	YE M	ZE M	DXE M/S	DYE M/S	ALTITUDE M					
150.0	68543	60561	201	1675.3	895.8	9.8	60926	67895	79.8927	28.3616	
160.0	85239	69026	305	1665.4	798.0	11.2	69590	84326	79.7314	28.3216	
170.0	101868	76531	424	1660.7	703.3	12.6	100661	77335	79.5712	28.2816	
180.0	118459	83096	556	1657.5	609.6	13.9	84181	116937	79.4118	28.2414	
190.0	135020	88725	702	1654.7	516.3	15.3	90134	133169	79.2530	28.2009	
200.0	151554	93423	862	1652.0	423.2	16.6	95197	149366	79.0947	28.1603	
210.0	168059	97190	1033	1649.1	330.3	17.8	99370	165535	78.9368	28.1194	
220.0	184535	100029	1218	1646.1	237.5	19.0	102657	181681	78.7793	28.0782	
230.0	200982	101941	1414	1644.1	144.8	20.2	105056	197810	78.6221	28.0368	
240.0	217396	102925	1622	1639.9	52.1	21.4	106570	213927	78.4652	27.9951	
250.0	233779	102983	1842	1636.6	-40.5	22.5	107198	230039	78.3085	27.9531	
260.0	250127	102116	2073	1633.1	-133.1	23.6	106940	246149	78.1520	27.9109	
270.0	266440	100322	2314	1629.5	-225.7	24.6	105797	262265	77.9956	27.8683	
280.0	282717	97601	2565	1625.8	-318.4	25.7	103768	278391	77.8393	27.8254	
290.0	298957	93954	2827	1622.0	-411.1	26.6	100854	294533	77.6830	27.7822	
300.0	315157	89379	3098	1618.0	-503.9	27.6	97051	310697	77.5266	27.7386	
310.0	331317	83875	3378	1613.9	-596.9	28.5	92361	326887	77.3701	27.6947	
320.0	347434	77441	3667	1609.5	-689.9	29.3	86782	343109	77.2135	27.6505	
330.0	3633506	70077	3964	1604.8	-782.9	30.1	80313	359366	77.0567	27.6059	
340.0	379526	61783	4269	1598.9	-875.7	30.9	72955	375660	76.8997	27.5609	
350.0	395473	52569	4581	1589.8	-966.8	31.5	64716	391976	76.7426	27.5155	
360.0	411291	42468	4898	1571.0	-1051.7	31.9	55625	408261	76.5860	27.4700	
370.0	426798	31603	5217	1522.2	-1114.9	31.7	45795	424338	76.4316	27.4248	
380.0	441392	20438	5524	1365.8	-1092.8	29.0	35642	439575	76.2854	27.3816	
390.0	459173	10570	5777	939.7	-832.5	20.4	26620	451974	76.1665	27.3466	
400.0	4662850	4199	5924	439.9	-459.7	9.7	20745	459136	76.0979	27.3262	
410.0	4644155	-1560	5990	185.8	-264.8	4.2	17499	462311	76.0675	27.3171	
420.0	464805	-3524	6019	89.9	-207.0	2.1	15307	463778	76.0534	27.3129	
430.0	465108	-11218	6042	44.5	-187.7	1.1	13396	464569	76.0458	27.3106	
440.0	465109	-5324	6045	18.7	-172.5	0.5	11623	465005	76.0417	27.3093	
450.0	465218	-6978	6045	4.6	-158.7	0.1	9981	465235	76.0395	27.3086	
460.0	465223	-8504	6045	-2.7	-146.5	-0.0	8460	465352	76.0384	27.3083	
470.0	465177	-9912	6044	-6.1	-135.4	-0.1	7051	465410	76.0378	27.3081	
480.0	464806	-15684	6036	-7.1	-126.0	-0.1	5744	465438	76.0376	27.3080	
490.0	464737	-16657	6035	-6.8	-118.0	-0.2	4523	465451	76.0375	27.3079	
500.0	464955	-13581	6039	-7.7	-111.1	-0.2	3376	465459	76.0374	27.3079	
510.0	464879	-14661	6038	-7.4	-105.0	-0.2	2293	465463	76.0374	27.3078	
520.0	464806	-15684	6036	-7.1	-99.7	-0.1	1268	465466	76.0373	27.3078	
530.0	464737	-16657	6035	-6.8	-94.9	-0.1	293	465468	76.0373	27.3078	
											IMPACT
	533.1	464716	-16949	6034	-6.7	-93.6	-0.1	0	465468	76.0373	27.3078

TABLE XIII  
S-1B STAGE FREE FLIGHT TRAJECTORY

EARTH-FIXED PLUMBLINE POSITIONS				EARTH-FIXED PLUMBLINE VELOCITIES				RANGE NM				LONG DEG	
TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	ALTITUDE FT					LAT DEG	
150.0	224879	198692	658	5496.3	2939.0	32.1	199890	36.637	79.8927	28.3616			
160.0	279657	226464	1002	54664.0	2618.2	36.7	228313	45.503	79.7314	28.3216			
170.0	334212	251087	1391	5448.6	2307.5	41.2	253725	54.317	79.5712	28.2816			
180.0	388644	272623	1826	5438.1	2000.0	45.7	276186	63.100	79.4118	28.2414			
190.0	442979	291092	2305	5428.9	1693.9	50.1	295716	71.859	79.2530	28.2009			
200.0	497223	306504	2827	5419.8	1388.6	56.3	312325	80.599	79.0947	28.1603			
210.0	551375	318865	3391	5410.5	1083.7	58.5	326018	89.324	78.9368	28.1194			
220.0	605431	328179	3995	5400.8	779.2	62.5	336800	98.036	78.7793	28.0782			
230.0	659388	334450	4640	5390.7	475.0	66.4	344672	106.740	78.6221	28.0368			
240.0	713243	337681	5323	5380.2	171.1	70.2	349638	115.437	78.4652	27.9951			
250.0	766990	337878	6044	5369.3	-132.8	73.9	351698	124.130	78.3085	27.9531			
260.0	826627	335025	6800	5358.0	-436.6	77.4	350854	132.824	78.1520	27.9109			
270.0	874148	329139	7592	5346.3	-740.5	80.9	347104	141.520	77.9956	27.8683			
280.0	927551	320214	8417	5334.1	-1044.5	86.2	340448	150.222	77.8393	27.8254			
290.0	986829	308247	9275	5321.6	-1348.8	87.3	330884	158.932	77.6830	27.7822			
300.0	1033980	293237	10163	5308.5	-1653.3	90.4	318410	167.654	77.5266	27.7386			
310.0	1086998	275180	11082	5295.0	-1958.2	93.3	303023	176.391	77.3701	27.6947			
320.0	1139876	254073	12030	5280.7	-2263.4	96.1	284718	185.144	77.2135	27.6505			
330.0	1192606	229912	13005	5264.9	-2568.7	98.8	263495	193.917	77.0567	27.6059			
340.0	1245163	202702	14005	5245.6	-2872.9	101.3	239354	202.709	76.8997	27.5609			
350.0	1297485	172470	15029	5215.8	-3171.8	103.4	212322	211.513	76.7426	27.5155			
360.0	1349378	139330	16070	5154.3	-3450.5	104.7	182498	220.301	76.5860	27.4700			
370.0	1400257	103686	17116	4994.0	-3657.9	103.9	150245	228.976	76.4316	27.4248			
380.0	1448138	67055	18123	4481.1	-3585.3	95.2	116937	237.199	76.2854	27.3818			
390.0	1486788	34680	18952	3082.9	-2731.4	66.9	87337	243.889	76.1665	27.3466			
400.0	1508902	13775	19436	1443.3	-1508.3	31.9	68062	247.753	76.0975	27.3262			
410.0	1518937	2398	19651	609.5	-868.8	13.8	57410	249.466	76.0675	27.3171			
420.0	152818	-5120	19749	294.9	-679.0	6.8	50221	250.258	76.0534	27.3129			
430.0	152950	-11564	19799	146.1	-615.7	3.5	43949	250.685	76.0458	27.3106			
440.0	152948	-17468	19823	61.5	-565.9	1.5	38133	250.920	76.0417	27.3093			
450.0	1526306	-22896	19832	15.0	-520.8	0.4	32745	251.044	76.0395	27.3083			
460.0	152322	-27902	19833	-8.8	-480.7	-0.2	27754	251.107	76.0384	27.3083			
470.0	1526171	-32522	19830	-19.9	-444.4	-0.4	23135	251.139	76.0378	27.3081			
480.0	1525946	-26807	19825	-24.3	-413.3	-0.5	18845	251.154	76.0376	27.3080			
490.0	1525696	-40805	19820	-25.5	-387.1	-0.5	14839	251.161	76.0375	27.3079			
500.0	1526442	-44560	19814	-25.0	-364.4	-0.5	11076	251.165	76.0374	27.3079			
510.0	1525194	-48103	19809	-24.3	-344.5	-0.5	7524	251.167	76.0374	27.3078			
520.0	1524955	-51459	19804	-23.3	-327.1	-0.5	4160	251.169	76.0373	27.3078			
530.0	1522727	-54650	19800	-22.3	-311.5	-0.4	961	251.170	76.0373	27.3078			
IMPACT													
533.1	1524658	-55608	19798	-22.0	-307.1	-0.4	0	251.170	76.0373	27.3078			

TABLE XIV  
S-IVB STAGE FREE FLIGHT TRAJECTORY

EARTH-FIXED PLUMBLINE POSITIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	ALTITUDE M	RANGE M	LONG DEG	LAT DEG
850.0	319304.9	-357364	102524	5763.0	-2530.3	285.0	437797	3113073	52.5013	17.5635
860.0	3250493	-383009	105383	5725.6	-2598.7	286.8	442398	3171849	52.1719	17.3057
870.0	3307559	-409336	108259	5687.6	-2666.6	288.5	446798	3230542	51.5367	17.0468
880.0	3364242	-436341	111152	5649.0	-2734.1	290.1	450998	3289157	51.0576	16.7869
890.0	3420537	-464018	114060	5609.9	-2801.2	291.6	454998	3347696	50.5806	16.5260
900.0	3476438	-492364	116983	5570.3	-2867.9	293.0	458797	3406164	50.1055	16.2642
910.0	3531940	-521374	119921	5530.1	-2934.1	294.4	462396	3464565	49.6324	16.0013
920.0	3587038	-551044	122871	5489.4	-2999.9	295.7	465793	3522901	49.1611	15.7375
930.0	3641725	-581370	125834	5448.1	-3065.3	296.9	468990	3581178	48.6916	15.4728
940.0	3695998	-612348	128808	5406.3	-3130.2	298.0	471987	3639399	48.2239	15.2071
950.0	3749849	-643973	131793	5364.0	-3194.7	299.0	474782	3697567	47.7579	14.9404
960.0	3803275	-676241	134787	5321.1	-3258.8	299.9	477376	3755686	47.2936	14.6729
970.0	3856269	-709148	137790	5277.7	-3322.5	300.7	479768	3813760	46.8308	14.4044
980.0	3908827	-742689	140801	5233.8	-3385.7	301.5	481960	3871792	46.3696	14.1351
990.0	3960944	-7768860	143819	5189.4	-3448.5	302.1	483950	3929787	45.9099	13.8649
1000.0	4012613	-811657	146843	5144.4	-3510.9	302.7	485738	3987747	45.4517	13.5938
1010.0	4063830	-847076	149872	5099.0	-3572.8	303.2	487326	4045677	44.9948	13.3218
1020.0	4114590	-8831112	152906	5053.0	-3634.3	303.5	488711	4103580	44.5392	13.0490
1030.0	4166887	-919761	155943	5006.5	-3695.4	303.8	489895	4161459	44.0849	12.7753
1040.0	4214717	-957019	158982	4959.4	-3756.1	304.0	490878	4219319	43.6318	12.5007
1050.0	4264074	-994882	162023	4911.9	-3816.3	304.1	491659	4277163	43.1800	12.2253
1060.0	4312953	-1033344	165065	4863.9	-3876.1	304.2	492238	4334995	42.7299	11.9491
1070.0	4361349	-1072403	168106	4815.3	-3935.5	304.1	492615	4392818	42.2795	11.6721
1080.0	4409257	-1112053	171146	4766.2	-3996.4	303.9	492792	4450636	41.8308	11.3943
1090.0	4456671	-1152293	174184	4716.7	-4053.0	303.7	492766	4508452	41.3831	11.1156
1100.0	4503587	-1193110	177219	4666.6	-4111.0	303.3	492539	4566270	40.9362	10.8361
1110.0	4550000	-1234509	180250	4616.0	-4168.7	302.9	492110	4624094	40.4903	10.5558
1120.0	4595904	-127482	183276	4564.9	-4225.9	302.3	491479	4681928	40.0451	10.2748
1130.0	4641295	-1319025	186296	4513.2	-4282.7	301.7	490647	4739774	39.6007	9.9929
1140.0	4686167	-1362134	189309	4461.2	-4339.0	300.9	489614	4797637	39.1571	9.7103
1150.0	4730515	-1405804	192314	4408.5	-4394.9	300.1	488379	4855520	38.7140	9.4268
1160.0	4774334	-1450030	195311	4355.4	-4450.3	299.2	486942	4913427	38.2716	9.1426
1170.0	4817620	-1494809	198298	4301.7	-4505.3	298.2	485304	4971362	37.8297	8.8576
1180.0	4860367	-1540135	201274	4247.6	-4559.9	297.0	483465	5029327	37.3884	8.5719
1190.0	4902569	-1586005	204238	4192.9	-4614.0	295.8	481425	5087327	36.9474	8.2853
1200.0	4944423	-1632414	207190	4137.8	-4667.7	294.5	479183	5145366	36.5069	7.9981
1210.0	4985323	-1679358	210128	4082.1	-4720.9	293.1	476741	5203447	36.0667	7.7100
1220.0	5025863	-1726832	213052	4025.9	-4773.7	291.6	474097	5261573	35.6268	7.4212
1230.0	5065839	-1774831	215959	3969.3	-4826.0	290.0	471253	5319749	35.1872	7.1316
1240.0	5105246	-1823351	218851	3912.1	-4877.9	288.3	468208	5377798	34.7477	6.8413
1250.0	5144079	-1872387	221725	3854.4	-4929.3	286.5	464962	5436263	34.3084	6.5502
1260.0	5182332	-1921935	224580	3796.2	-4980.3	284.6	461516	5494610	33.8692	6.2584
1270.0	5220000	-1971991	227416	3737.5	-5030.8	282.6	457869	5553020	33.4300	5.9559
1280.0	5257079	-2025494	230231	3678.3	-5080.8	280.4	454023	5611499	32.9908	5.6726

TABLE XIV  
S-IVB STAGE FREE FLIGHT TRAJECTORY

EARTH-FIXED PLUMBLINE POSITIONS				EARTH-FIXED PLUMBLINE VELOCITIES				RANGE				LONG DEG		LAT DEG	
TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	ALTITUDE M								
1290.0	5293563	-2073605	233024	3618.5	-5130.4	278.2	449976	5670049	32.5515	5.3785					
1300.0	5322948	-2125155	235795	3558.3	-5179.4	275.9	445229	5728675	32.1121	5.0837					
1310.0	5364727	-2177192	238542	3497.6	-5228.1	273.5	441282	5787380	31.6725	4.7882					
1320.0	5399397	-2229714	241265	3436.3	-5276.2	271.0	436636	5846168	31.2327	4.4920					
1330.0	5433451	-2282715	243962	3374.5	-5323.9	268.4	431790	5905043	30.7926	4.1950					
1340.0	5466885	-2336190	246632	3312.0	-5371.0	265.7	426745	5964010	30.3522	3.8973					
1350.0	5499693	-2390134	249275	3249.4	-5417.7	262.8	421501	6023071	29.9114	3.5988					
1360.0	5531871	-2444542	251889	3186.1	-5463.9	259.9	416058	6082230	29.4702	3.2996					
1370.0	5563413	-2499410	254473	3122.3	-5509.6	256.9	410417	6141492	29.0284	2.9998					
1380.0	5594314	-2554733	257026	3057.9	-5554.8	253.8	404578	6200860	28.5861	2.6991					
1390.0	5624568	-2610505	259548	2993.0	-5599.5	250.5	398540	6260339	28.1432	2.3978					
1400.0	5654172	-2666722	262037	2927.6	-5643.7	247.2	392304	6319933	27.6996	2.0957					
1410.0	5683118	-2723378	264491	2861.7	-5687.4	243.7	385871	6379644	27.2553	1.7929					
1420.0	5711403	-2780469	266911	2795.2	-5730.6	240.2	379240	6439478	26.8102	1.4894					
1430.0	5739020	-2837989	269295	2728.3	-5773.3	236.5	372412	6499439	26.3643	1.1852					
1440.0	5765966	-2895932	271642	2660.8	-5815.4	232.8	365388	6559531	25.9175	0.8803					
1450.0	5792233	-2954295	273950	2592.7	-5857.0	228.9	358167	6619757	25.4697	0.5747					
1460.0	5817818	-3013070	276079	2524.2	-5898.1	224.9	350749	6680123	25.0209	0.2683					
1470.0	5842714	-3072254	278449	2455.1	-5938.6	220.9	343136	6740631	24.5710	-0.0387					
1480.0	5866916	-3131840	280636	2385.4	-5978.6	216.7	335328	6801287	24.1200	-0.3465					
1490.0	5390420	-3191824	282782	2315.3	-6018.0	212.4	327324	6862095	23.6679	-0.6549					
1500.0	593219	-3252198	284884	2244.5	-6056.9	208.0	319125	6923058	23.144	-0.9640					
1510.0	5935308	-3312959	286949	2173.0	-6095.2	203.5	310733	6984182	22.7597	-1.2739					
1520.0	5956682	-3374100	288953	2101.5	-6132.9	198.9	302145	7045471	22.3035	-1.5844					
1530.0	5977336	-3435616	290918	2029.2	-6170.1	194.1	293365	7106928	21.8459	-1.8956					
1540.0	5997264	-3497500	292835	1956.3	-6206.7	189.3	284391	7168559	21.3868	-2.2075					
1550.0	6016460	-3559748	294703	1882.9	-6242.7	184.4	275224	720369	20.9262	-2.5201					
1560.0	6034919	-3622352	296522	1808.9	-6278.1	179.3	265865	7292361	20.4639	-2.8334					
1570.0	6056335	-3685307	298289	1734.4	-6312.9	174.2	256314	7354540	19.9998	-3.1473					
1580.0	6069604	-3748607	300005	1659.3	-6347.1	168.9	246572	7416910	19.5340	-3.4619					
1590.0	6085819	-3812246	301667	1583.7	-6380.7	163.5	236639	7479478	19.0664	-3.7771					
1600.0	6101276	-3876218	303274	1507.5	-6413.6	158.0	226515	754246	18.5968	-4.0930					
1610.0	6115967	-3940516	304827	1430.8	-6445.9	152.4	216201	7605220	18.1253	-4.4096					
1620.0	6129888	-405134	306323	1353.5	-6477.6	146.7	205698	7668405	17.6217	-4.7268					
1630.0	6143034	-4070065	307761	1275.6	-6508.6	140.9	195007	7731806	17.1760	-5.0446					
1640.0	6155398	-4135304	309141	1197.2	-6539.0	135.0	184127	7795427	16.6980	-5.3631					
1650.0	6166975	-4200842	310460	1118.2	-6668.7	129.0	173059	7859274	16.2178	-5.6821					
1660.0	6177759	-4266674	311719	1038.6	-6597.7	122.8	161804	7923351	15.7352	-6.0018					
1670.0	6187745	-4332793	312916	958.5	-6626.0	116.6	150363	7987664	15.2502	-6.3221					
1680.0	6196926	-4399192	314050	877.8	-6653.7	110.2	138736	8052218	14.7626	-6.6430					
1690.0	6205298	-4465864	315120	796.5	-6680.6	103.7	126925	8117017	14.0725	-6.9645					
1700.0	6212854	-4532801	316124	714.7	-6706.8	97.1	114928	8182068	13.7797	-7.2865					
1710.0	6219589	-4599996	317062	632.3	-6732.2	90.4	102748	8247374	13.2861	-7.6092					
1720.0	6225497	-4667440	317932	549.2	-6756.3	83.6	90386	8312940	12.7857	-7.9323					

TABLE XIV  
S-IVB STAGE FREE FLIGHT TRAJECTORY  
EARTH-FIXED PLUMBLINE POSITIONS      EARTH-FIXED PLUMBLINE VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	ALTITUDE M	RANGE M	LONG DEG	LAT DEG
1730.0	6230569	-4735102	318734	465.2	-6773.8	76.6	77846	8378748	12.2846	-8.2559
1740.0	6234790	-4802795	319464	378.2	-6751.8	69.1	65162	8444628	11.7820	-8.5790
1750.0	6238105	-4869564	320111	282.5	-6548.0	59.9	52500	8509659	11.2848	-8.8971
1760.0	6240369	-4931672	320644	165.8	-5692.4	45.4	40525	8570192	10.8212	-9.1924
1770.0	6241361	-4978798	320990	35.4	-3573.2	23.2	31115	8616113	10.4690	-9.4159
1780.0	6241252	-5004179	321130	-47.2	-1697.8	6.7	25556	8640762	10.2796	-9.5357
1790.0	6240548	-5016246	321155	-90.1	-840.5	-0.8	22307	8652358	10.1905	-9.5920
1800.0	6239489	-5022586	321126	-120.6	-475.4	-4.6	19934	8658310	10.1447	-9.6208
1810.0	6238155	-5026355	321068	-145.7	-298.5	-7.0	17837	8661703	10.1186	-9.6372
1820.0	6236583	-5028828	320988	-167.7	-204.5	-8.8	15778	8663783	10.1025	-9.6473
1830.0	6234833	-5030553	320895	-180.3	-144.3	-9.8	13704	8665098	10.0924	-9.6536
1840.0	6233014	-5031773	320795	-181.7	-102.3	-10.1	11667	8665906	10.0861	-9.6575
1850.0	6231224	-5032642	320695	-175.3	-73.7	-9.8	9732	8666379	10.0825	-9.6597
1860.0	6229519	-5033279	320599	-165.2	-55.1	-9.3	7929	8666643	10.0804	-9.6610
1870.0	6227922	-5033766	320509	-154.1	-43.3	-8.7	6263	8666783	10.0793	-9.6616
1880.0	6226437	-5034158	320425	-142.9	-35.8	-8.1	4726	8666855	10.0788	-9.6619
1890.0	6225060.	-5034489	320348	-132.6	-30.9	-7.5	3308	8666889	10.0785	-9.6621
1900.0	6223780	-5034781	320276	-123.6	-27.7	-7.0	1993	8666905	10.0783	-9.6621
1910.0	6222583	-5035046	320208	-115.9	-25.5	-6.5	765	8666913	10.0783	-9.6621
IMPACT										
1916.6	6221836	-5035209	320167	-111.6	-24.3	-6.3	0	8666916	10.0783	-9.6621

TABLE XV  
S-IVB STAGE FREE FLIGHT TRAJECTORY

EARTH-FIXED PLUMBLINE POSITIONS				EARTH-FIXED PLUMBLINE VELOCITIES				RANGE NM				LAT DEG	
TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	ALTITUDE FT						
850.0	10475883	-1172456	336365	18907.6	+8301.6	935.0	1436343	1679.836	52.5013	17.5635			
860.0	10664346	-1256595	345744	18784.7	-8525.9	940.8	1451436	1711.552	52.0179	17.3057			
870.0	10851571	-1342699	355180	18660.0	-8748.8	946.4	1465873	1743.224	51.5367	17.0468			
880.0	11037540	-1431566	364670	18533.5	-8970.3	951.7	1479652	1774.852	51.0576	16.7869			
890.0	11222234	-1522370	374213	18405.2	-9190.4	956.7	1492775	1806.441	50.5806	16.5260			
900.0	11405638	-1615369	383803	18275.2	-9409.1	961.4	1505239	1837.991	50.1055	16.2642			
910.0	11587731	-1710546	393440	18143.3	-9626.3	965.9	1517046	1869.504	49.6324	16.0013			
920.0	11768497	-1807890	403120	18009.7	-9842.2	970.1	1528194	1900.983	49.1611	15.7375			
930.0	11947918	-1907385	412840	17874.3	-10056.6	973.9	1538683	1932.429	48.6916	15.4728			
940.0	12125977	-2009018	422598	17737.2	-10269.7	977.5	1548513	1963.846	48.2239	15.2071			
950.0	12302655	-2112775	432390	17598.3	-10481.4	980.9	1557683	1995.234	47.7579	14.9404			
960.0	12477936	-2218641	442214	17457.7	-10691.6	983.9	1566193	2026.595	47.2936	14.6729			
970.0	12651803	-2326602	452067	17315.4	-10900.5	986.6	1574043	2057.932	46.8308	14.4044			
980.0	12824237	-2436645	461945	17171.3	-11107.9	989.0	1581233	2089.247	46.3696	14.1351			
990.0	12995223	-2548755	471847	17025.6	-11314.0	991.2	1587762	2120.541	45.9099	13.8649			
1000.0	13164741	-2662919	481768	16878.1	-11518.6	993.1	1593630	2151.817	45.4517	13.5938			
1010.0	13332776	-2779123	491706	16728.9	-11721.9	994.6	1598837	2183.076	44.9948	13.3218			
1020.0	13499311	-2897351	501659	16578.0	-11923.7	995.9	1603383	2214.321	44.5392	13.0490			
1030.0	13664329	-3017592	511623	16425.4	-12124.1	996.8	1607268	2245.553	44.0849	12.7753			
1040.0	13827811	-3139829	521595	16271.2	-12323.2	997.5	1610491	2276.775	43.6318	12.5007			
1050.0	13989743	-326450	531572	16115.2	-12520.8	997.9	1613053	2307.988	43.1800	12.2253			
1060.0	14150107	-3390239	541551	15957.6	-12717.0	997.9	1614954	2339.194	42.7292	11.9491			
1070.0	14308887	-35118384	551529	15798.2	-12911.8	997.7	1616192	2370.396	42.2795	11.6721			
1080.0	14466066	-3648469	561503	15637.2	-13105.1	997.1	1616770	2401.595	41.8308	11.3943			
1090.0	14621624	-3780882	571470	15474.6	-13297.1	996.3	1616686	2426.793	41.3831	11.1156			
1100.0	14775549	-3914407	581427	15310.2	-13487.6	995.1	1615940	2463.992	40.9362	10.8361			
1110.0	14927822	-4050230	591371	15144.2	-13676.8	993.6	1614533	2495.194	40.4903	10.5558			
1120.0	15078426	-4187937	601299	14976.6	-13864.4	991.8	1612464	2526.402	40.0451	10.2748			
1130.0	15227346	-4327513	611207	14807.2	-14050.7	989.7	1609735	2557.616	39.6007	9.9929			
1140.0	15374563	-4468945	621093	14636.2	-14235.5	987.3	1603444	2588.839	39.1571	9.7103			
1150.0	15520062	-4612219	630952	14463.6	-14418.9	984.6	1602292	2620.073	38.7140	9.4268			
1160.0	15663827	-4757318	640784	14289.3	-14600.8	981.6	1597579	2651.321	38.2716	9.1426			
1170.0	15805840	-4904230	650583	14113.3	-14781.3	978.2	1592206	2682.582	37.8297	8.8576			
1180.0	15946085	-5052939	660347	13935.6	-14960.3	974.6	1586172	2713.861	37.3884	8.5719			
1190.0	16084546	-5203432	670073	13756.3	-15137.9	970.6	1579478	2745.158	36.9474	8.2853			
1200.0	16221204	-5355693	679757	13575.4	-15314.0	966.2	1572124	2776.476	36.5069	7.9981			
1210.0	16356046	-5509707	689397	13392.8	-15488.7	961.6	1564110	2807.817	36.0667	7.7100			
1220.0	16489052	-5665461	698988	13204.5	-15661.8	956.7	1555437	2839.182	35.6268	7.4212			
1230.0	16620208	-5822938	708528	13022.5	-15833.5	951.4	1546105	2870.575	35.1872	7.1316			
1240.0	16749495	-5982124	718015	12834.9	-16003.7	945.8	1536115	2901.995	34.7477	6.8413			
1250.0	16876899	-6143005	727443	12645.7	-16172.3	939.8	1525466	2933.447	34.3084	6.5502			
1260.0	17002401	-6305565	736811	12454.7	-16339.5	933.6	1514160	2964.931	33.8692	6.2584			
1270.0	17125985	-6469789	746114	12262.1	-16505.2	927.0	1502196	2996.449	33.4300	5.9659			
1280.0	17247636	-6635662	755350	12067.8	-16669.3	920.1	1489575	3028.005	32.9008	5.6726			

TABLE XV  
S-IVB STAGE FREE FLIGHT TRAJECTORY

EARTH-FIXED PLUMBLINE POSITIONS						EARTH-FIXED PLUMBLINE VELOCITIES						RANGE		LONG	
TIME	X E FT	Y E FT	Z E FT	DXE FT/S	DYE FT/S	DZE FT/S	DT/S	ALTITUDE FT	LAT DEG	LONG DEG	NH	NH	NH	NH	
1290.0	17367335	-6803169	764514	11871.9	-16831.9	912.8		1476298	3059.599	32.5515	5.3785				
1300.0	17485065	-6972294	773605	11674.2	-16992.9	905.3		1462365	3091.234	32.1121	5.0837				
1310.0	17600811	-7143022	782619	11474.9	-17152.4	897.4		1447775	31122.912	31.6725	4.7882				
1320.0	17714556	-7313337	791551	11273.9	-17310.4	889.1		1432532	3154.634	31.2327	4.4920				
1330.0	17826282	-7489224	800400	11071.3	-17466.7	880.5		1416634	31186.404	30.7926	4.1950				
1340.0	17935973	-7666666	809161	10866.9	-17621.5	871.6		1400082	3128.222	30.3522	3.8973				
1350.0	18043613	-7841648	817831	10660.8	-17774.7	862.4		1382878	3250.092	29.9114	3.5988				
1360.0	18149183	-8020154	826407	10453.1	-17926.3	852.8		1367021	3282.015	29.4702	3.2996				
1370.0	18252667	-8200167	834885	10243.6	-18076.2	842.8		1346513	3313.993	29.0284	2.9998				
1380.0	18354048	-8381672	843262	10032.5	-18224.6	832.6		1327554	3346.029	28.5861	2.6991				
1390.0	18453308	-8564662	851535	9819.6	-18371.2	821.9		1307545	3378.124	28.1432	2.3978				
1400.0	18550432	-8749091	859700	9605.0	-18516.2	811.0		1287086	3410.281	27.6996	2.0957				
1410.0	18645401	-8934970	867754	9388.7	-18659.6	799.7		1265880	3442.502	27.2553	1.7929				
1420.0	18738199	-9122276	875693	9170.7	-18801.2	788.0		1244225	3474.789	26.8102	1.4894				
1430.0	18828808	-9310988	883513	8951.0	-18941.2	776.1		1221825	3507.144	26.3643	1.1852				
1440.0	18917211	-9501092	891212	8729.5	-19079.4	763.7		1198778	3539.570	25.9175	0.8803				
1450.0	19003391	-9692570	898786	8506.3	-19215.9	751.0		1175088	3572.069	25.4697	0.5747				
1460.0	19087329	-9885404	906232	8281.3	-19350.6	738.0		1150153	3604.642	25.0209	0.2683				
1470.0	19169009	-10079576	913545	8054.6	-19483.6	724.6		1125775	3637.293	24.5710	-0.0387				
1480.0	19248414	-10275069	920723	7826.2	-19614.8	710.9		1100157	3670.023	24.1200	-0.3465				
1490.0	19325525	-10471865	927761	7596.0	-19744.1	696.8		1073898	3702.836	23.6679	-0.6549				
1500.0	19400325	-10669945	934657	7364.0	-19871.0	682.4		1047000	3735.732	23.2144	-0.9640				
1510.0	19472797	-10869291	941407	7130.2	-19997.4	667.6		1019464	3768.715	22.7597	-1.2739				
1520.0	19542922	-11069885	948007	6894.7	-20121.2	652.4		991291	3801.786	22.3035	-1.5844				
1530.0	19610683	-11271708	954454	6657.4	-20243.2	636.9		962483	3834.949	21.8459	-1.8956				
1540.0	19676062	-11474741	960745	6418.3	-20363.2	621.1		933041	3868.206	21.3868	-2.2075				
1550.0	19739041	-11678964	966875	6177.4	-20481.3	604.9		902967	3901.559	20.9262	-2.5201				
1560.0	19799603	-11884359	972841	5934.8	-20597.4	588.3		872261	3935.010	20.4639	-2.8334				
1570.0	19857728	-12090905	978639	5690.3	-20711.6	571.4		840926	3968.562	19.9998	-3.1473				
1580.0	19913400	-12298583	984267	5444.0	-20823.8	554.1		808963	4002.218	19.5340	-3.4619				
1590.0	19966599	-12507373	989720	5195.8	-20933.9	536.5		776373	4035.980	19.0664	-3.7771				
1600.0	20017309	-12717253	994995	4945.9	-21042.0	518.5		743159	4069.850	18.5968	-4.0930				
1610.0	20065509	-12928205	1000088	4694.1	-21148.1	500.1		709322	4103.831	18.1253	-4.4096				
1620.0	20111182	-13140206	1004996	4440.5	-21252.0	481.4		674863	4137.926	17.6517	-4.7268				
1630.0	20154311	-133553235	1009715	4185.0	-21353.8	462.3		639785	4172.138	17.1760	-5.0446				
1640.0	20194875	-13567272	1014241	3927.0	-21453.4	442.9		604090	4206.469	16.6980	-5.3631				
1650.0	20232857	-13782293	1018571	3668.6	-21550.8	423.1		567778	4240.921	16.2178	-5.6821				
1660.0	20268238	-13998278	1022702	3407.6	-21646.0	402.9		530854	4275.497	15.7352	-6.0018				
1670.0	20301000	-14215204	1026628	3144.7	-21739.0	382.4		493318	4310.201	15.2502	-6.3221				
1680.0	20331124	-14433047	1030348	2879.9	-21829.6	361.5		455172	4345.034	14.7626	-6.6430				
1690.0	20359590	-14651786	103858	2613.0	-21981.0	340.3		416419	4380.001	14.2725	-6.3631				
1700.0	20383381	-14871397	1037153	2344.8	-22003.9	318.7		377061	4415.102	13.7797	-7.2865				
1710.0	2040477	-15091854	1040230	2014.3	-22087.3	296.7		337101	4450.342	13.2841	-7.6092				
1720.0	2042859	-15313127	1043086	1801.9	-22166.3	274.4		296543	4485.722	12.7857	-7.9323				

TABLE XV  
S-IVB STAGE FREE FLIGHT TRAJECTORY  
EARTH-FIXED PLUMBLINE POSITIONS      EARTH-FIXED PLUMBLINE VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	ALTITUDE FT	RANGE NM	LONG DEG	LAT DEG
1730.0	20441501	-15535115	1045715	1526.1	-222223.7	251.4	255402	4521.233	12.2846	-8.2559
1740.0	20455349	-15757203	1048109	1240.9	-22151.6	226.8	213784	4556.782	11.7820	-8.5790
1750.0	20466224	-15976262	1050233	926.7	-21482.8	196.4	172242	4591.873	11.2848	-8.8971
1760.0	20473653	-16180028	1051982	544.0	-18675.9	149.0	132955	4624.537	10.8212	-9.1924
1770.0	20476906	-16334643	1053117	116.2	-11723.0	76.2	102083	4649.316	10.4690	-9.4159
1780.0	20476550	-16417912	1053577	-155.0	-5570.1	22.1	83846	4662.617	10.2796	-9.5357
1790.0	20474239	-16457503	1053659	-295.6	-2757.4	-2.6	73187	4668.874	10.1905	-9.5920
1800.0	20470764	-16478302	1053565	-395.5	-1559.8	-15.1	65402	4672.086	10.1447	-9.6208
1810.0	20466388	-16490669	1053372	-478.0	-979.4	-23.0	58519	4673.917	10.1186	-9.6372
1820.0	20461230	-16498783	1053111	-550.1	-670.9	-28.8	51766	4675.040	10.1025	-9.6473
1830.0	20455490	-16504440	1052804	-591.7	-473.4	-32.2	44959	4675.749	10.0924	-9.6536
1840.0	20449521	-16508443	1052476	-596.1	-33.5	-33.0	38276	4676.185	10.0861	-9.6575
1850.0	20443649	-16511297	1052149	-575.1	-241.7	-32.2	31928	4676.440	10.0825	-9.6597
1860.0	20438055	-16513385	1051835	-542.1	-180.7	-30.5	26013	4676.583	10.0804	-9.6610
1870.0	20432816	-16514382	1051539	-505.6	-142.0	-28.5	20546	4676.658	10.0793	-9.6616
1880.0	20427943	-16516269	1051265	-468.9	-117.3	-26.5	15505	4676.697	10.0788	-9.6619
1890.0	20423425	-1651356	1051010	-435.1	-101.5	-24.5	10852	4676.716	10.0785	-9.6621
1900.0	20419225	-16518314	1050773	-405.5	-90.9	-22.8	6538	4676.724	10.0783	-9.6621
1910.0	20415298	-16519183	1050553	-380.3	-83.5	-21.4	2511	4676.728	10.0783	-9.6621
IMPACT										
1916.6	20412849	-16519718	1050415	-366.1	-79.8	-20.6	0	4676.730	10.0783	-9.6621

APPENDIX A  
DEFINITIONS OF SYMBOL

Symbol

XE, YE, ZE  
DXE, DYE, DZE  
DDXE, DDYE, DDZE

Definitions

Position, velocity and acceleration components in the Earth-Fixed Plumline Coordinate System. The origin of this system is the projection of the center of gravity of the complete vehicle at first motion onto the Fischer Ellipsoid of 1960. The X-Z plane is tangent to the reference ellipsoid at the origin of the coordinate system. The positive X-axis is oriented in the flight azimuth direction, 105.0 deg E of N. The Y-axis is normal to the X-Z plane and is positive above the origin. The Z-axis is normal to the X-Y plane and is in a right hand relation to the X-Y axes with the positive direction 195.0 deg E of N. The origin of this earth-fixed system rotates with an angular velocity identical to that of the earth. The earth-fixed coordinate system is shown in Figure 17.

XSP, YSP, ZSP  
DXSP, DYSP, DZSP  
DDXSP, DDYSP, DDZSP

Position, velocity and acceleration components in the Space-Fixed Ephemeris Coordinate System. The origin of this system is located at the geocentric center of the earth. The Z-axis points north along the earth's axis of rotation (through the north pole). The X-Y plane is coincident with the equatorial plane. The X-axis points through the vernal equinox. The reference equinox and equator are the mean equinox and equator of date for the epoch of midnight or zero hours on the day of launch. The Y-axis is normal to the X-Z plane and in a right hand relation to the X-,Z-axes. The direction of the coordinate axes remain fixed in space although the origin continues to move with the center of the earth. The space-fixed ephemeris coordinate system is shown in Figure 17.

E.C.DIST  
LONG  
G.C.LAT

Position of vehicle in the Geographic Coordinate System. Position in this system is defined by the radius vector from the vehicle to the geocentric center of the earth (E.C.DIST), geocentric latitude (G.C.LAT) and longitude (LONG). A subvehicle point is defined as the intersection of the reference ellipsoid and the radius vector from the vehicle to the center of the earth. The geocentric latitude and longitude refer to the subvehicle point.

## DEFINITIONS OF SYMBOLS (CONT'D)

### Symbols

### Definitions

	Geocentric latitude is the angle between the radius vector and the equatorial plane, positive north of the equator. Longitude is the angle between the projection of the radius vector into the equatorial plane and the Greenwich meridian, measured positive east of the Greenwich meridian.
E.F. VEL	Earth-fixed velocity of vehicle in the <u>Geographic Coordinate System</u> . Velocity in this system is given in terms of azimuth (VEL-AZ), elevation (VEL-ELEV), and magnitude of the velocity vector (E.F.VEL). Azimuth is the angle between the projection of the velocity vector into the local horizontal plane and the north direction in this plane. Elevation is the angle between the velocity vector and the local horizontal plane. The local horizontal plane is defined as the plane perpendicular to the radius vector from the vehicle to the geocentric center of the earth. The geographic coordinate system is shown in Figure 17.
VEL-AZ	
VEL-ELEV	
S.F. VEL	Space-fixed velocity of vehicle in the <u>Geographic Coordinate System</u> . Velocity is given in terms of flight-path angle (FLT-PATH), heading angle (HEAD), and magnitude of the velocity vector (S.F.VEL). The flight-path angle is the angle between the space-fixed velocity vector and the plane normal to the radius vector from the vehicle to the geocentric center of the earth, measured positive upward from this plane. The heading angle is measured positive clockwise from north to the projection of the space-fixed velocity vector in the plane normal to the radius vector.
FLT-PATH	
HEAD	
LAT	Geodetic latitude of vehicle.
ALTITUDE	Distance from the subvehicle point to the center of gravity of the vehicle measured along the radius vector from the vehicle to the geocentric center of the earth.
RANGE	Surface range measured along a spherical earth from the launch site to the subvehicle point.

**APPENDIX B**  
**SPACECRAFT TRAJECTORY \***

Range Time (sec)	Duration of Coast (sec)	Radius From Center of Earth (ft)	Longitude (deg)	Geodetic Latitude (deg)	Space-fixed Velocity (ft/sec)	Heading Angle (deg)	Flight Path Angle (deg)	Altitude (ft)	Surface Range (nm)
854.95	356.25	22365861	-52.261	17.435	22035.4	117.117	3.996	1443318	1706.6
1423.8	141.9	21895175	-25.714	0.986	25824.2	120.686	-9.046	969455	3552.9
1565.7	648.1	21324798	-17.934	-4.002	26482.5	120.466	-8.597	399396	4101.9
2213.8	0.0	20924327	-11.149	-8.192	1510.7	90.000	-0.988	0	4578.3

\*These parameters were furnished by MSC.

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APPROVAL

TM X- 53472

SATURN AS-201/APOLLO POSTFLIGHT TRAJECTORY

By Jonathan B. Haussler and William G. Smith

This information in this report has been reviewed for security classification. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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